Duncan Graham

Fig. 2.

Lymphangioma of axilla.

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INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIATRICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS, PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY, OTOLOGY, RHINOLOGY, LARYNGOLOGY, HYGIENE, AND OTHER TOPICS OF INTEREST TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION THROUGHOUT THE WORLD

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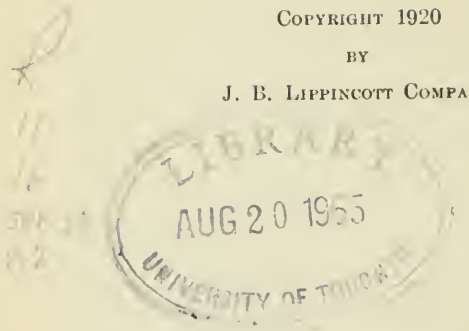

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Clinics

A CLINICAL LECTURE ON THE DIAGNOSIS AND TREATMENT OF TUBERCULOUS BONE AND JOINT DISEASE IN CHILDREN

DELIVERED IN THE POST-GRADUATE COURSE OF THE PHILADELPHIA PÆDIATRIC SOCIETY, AT THE CHILDREN'S HOSPITAL OF PHILADELPHIA, DECEMBER 12, 1919.

By ASTLEY P. C. ASHHURST, M.D.,
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I. PATHOLOGY

You have heard enough, in the previous lectures of this course, to know somewhat of the pathogenesis and morbid anatomy of tuberculosis in general, and I can be very brief in what I have to say on these topics. The tubercle bacilli lodging, as they usually do, on their first entrance into the body, either in the cervical, bronchial or mesenteric lymph-nodes, lead there a peaceful and usually overlooked existence. They may and probably do, from time to time, if these nodes caseate and rupture, escape into the general circulation, but usually perish because in their journey they find no suitable soil for their continued existence. If all goes well, they may not give evidence of their existence until adult life. But if somewhere in the body there is established in suitable soil a *locus minoris resistentiæ*, the bacilli in their journeys through the circulation eventually reach this area, find surroundings suitable for their existence, establish themselves in a new home and thrive—they occupy the land, and like the patriarchs and their progeny of old, become as the sea sands in multitude.

It has been pointed out by Ely (1911) that the most favorable soil in bone for the development of tubercle bacilli is one where lymphoid cells exist, such as form the synovial lining of joints; or red bone marrow, such as exists in children in the cancellous ends of bone, and in short bones of the carpus and tarsus. It thus happens that emboli of tubercle bacilli may occur in all parts of the body, but

except in such favorable localities as those just mentioned the bacilli will not survive; and even in favorable soil they may not survive unless the natural resistance of the part is already damaged. It is thus that you find, in about one-third of cases, a history of traumatism, usually comparatively slight, preceding, by a period of several weeks, the development of symptoms of tuberculous disease. Now it is very well known that all children sustain slight joint injuries from time to time, yet comparatively few develop tuberculous arthritis; so that clinical experience *a posteriori* confirms what we should expect *a priori* from our knowledge of morbid anatomy; and it is necessary to assume, even if it cannot be demonstrated clinically, that the child with tuberculous bone or joint disease has a primary tuberculous focus elsewhere in the body.

The injury which precedes the tuberculous joint symptoms rarely is severe; fractures scarcely ever are followed by tuberculosis, and fractures in the tuberculous heal normally. Two explanations are offered for this: one is that the more severe injury arouses better defensive action on the part of the patient; the other is that severe lesions require careful and prolonged treatment, and healing therefore is more apt to occur than after a trivial injury which often is neglected.

So you will find that the parents bring the child to you complaining of pain and disability; but unless you are more observant than the parents you will often overlook the true site of the disease because the pain is usually of the type known as *referred pain*. There is scarcely a year passes that I do not see one or more little children who have been treated symptomatically by their family physcian for weeks and sometimes for months for pains in their stomach, when a cursory examination of their back shows them to be suffering from tuberculosis of the spine, and demonstrates that the belly ache was merely pain referred along the intercostal or lumbar nerves. So, too, with disease of the hip-joint, the pain may be referred to the knee, along the obturator nerve, and all the embrocations and liniments which for weeks have been applied to the knee have been unavailing. Stiffness of the joint may have been noted by the parents for some days or weeks, apparent when the child first gets up in the mornings; such stiffness often wears away during the day, but toward evening the joint again becomes disabled, and this is evidenced by slight limp

and complaints of pain. Pain may be almost absent except when a joint is used; but frequently a joint which is painless when the child is awake will trouble it at night, causing restlessness; and on falling asleep and relaxing its muscles the child will experience "starting pains" which will rouse it momentarily from sleep with a "night cry." Along with these symptoms you will usually find a slight constant elevation of temperature.

II. DIAGNOSIS

Children suspected of tuberculous joint disease should be examined stripped. Nothing hinders so much proper appreciation of deformity or limitation of joint motion as the presence of clothing. And in examining children, as you know, it is first of all necessary to win their confidence; nothing so quickly repels them, especially if in pain, as abrupt, rough or brutal manners.

Inspection, even in early cases, frequently is enough to indicate the diagnosis. The child will be able to walk to and fro, and you can observe limp, evidences of deformity, or other disability. In many cases of tuberculosis of the spine, the child, though able to walk, is unwilling to do so because of pain, and will support himself on each piece of furniture he encounters, and when at rest may hold his thighs with his hands to aid in supporting his back. Have the child stoop to pick up something off the floor; if there is spinal disease you will often see him bend his knees and his hips, bringing his buttocks almost into contact with the floor until his hand can reach the object, rather than flex his spine to stoop forward normally. In the standing position, in early cases of hip disease you will notice by attentively inspecting the child from behind that there is flattening of the affected buttock, with disappearance of the normal gluteal fold on the same side (Fig. 1); and later, when you begin your physical examination, you will find that the diseased hip is held persistently in a slightly flexed and abducted position, a posture which accounts for the changes in outline just noted.

The *physical examination* of the suspected joint gives characteristic evidence of disease. There is spasm of the muscles around the joint, or at least limitation of motion in one or more directions. It becomes incumbent on you, therefore, to know the limits of normal movement, and to exclude in your examination compensatory move-

ments which may be made in adjacent joints—such especially as movements in the pelvic and lumbar joints which may simulate motions in the hip-joint, and motions between the scapula and trunk which simulate movements in the shoulder-joint. The surest way to ascertain limitation of motion is to compare the movements of the affected joint with those of the corresponding healthy joint. In the case of suspected *hip disease,* have the child recumbent, and beginning by testing the movements of the normal hip, show the child by your manner that you do not intend to cause him any pain; you will then find that very rarely is any resistance aroused. Test first the rotation of the hip, by placing the hand flat on the thigh above the knee, and rolling the limb in and out; try the same manœuvre on the diseased side; almost without exception the excursion will be less on the affected side. Then try abduction of the normal hip, by carrying the limb outward in the coronal plane; attentively watch the anterior superior spines of the iliac bones, and you will find that although they do not move when the normal hip is abducted, yet when an attempt to abduct the affected hip is made, it will be evident that the apparent motion of abduction is not occurring in the hip but in the lumbar spine, the pelvis tilting down on the healthy side and up on the side of the diseased hip when attempts to abduct the latter are made. Note next that the child's lumbar spine is not lying flat on the table, but is slightly arched (Fig. 2); now as you flex the healthy hip until the thigh comes almost into contact with the abdomen, you will observe not only that this lumbar lordosis becomes obliterated as you, by hyperflexion of the hip, flex the pelvis on the spine; but also that the thigh on the diseased side rises from the table and the diseased hip is seen to be held in a position of flexion by muscular spasm. On the contrary, when you gently flex the diseased hip as far as can be done without pain, the lumbar lordosis similarly disappears (Fig. 3), but the healthy thigh does not rise from the table, because as the pelvis becomes flexed on the spine there is the possibility of hyperextension in the normal hip, whereas in the diseased hip even full extension is impossible. Next, with the hip flexed to a right angle, test the abduction of the hip in this position: on the normal side you will find the thigh can be brought outward until the outer side of the knee nearly or quite touches the table, without any movement occurring in the pelvis; but on the diseased side abduction in this position is greatly limited. Finally,

Fig. 1.

Early stage of tuberculosis of left hip. Abduction and flexion, causing flattening of buttock and obliteration of the gluteal fold. Age 5 years. Duration 2 months.

Fig. 2.

Tuberculosis of right hip: persistent flexion of hip causing [illegible] when attempt is made to extend the hip. Age 3 years. Duration 9 months.

Fig. 3.

Tuberculosis of right hip: when the thigh is raised the lumbar lordosis disappears.

Fig. 4.

Tuberculosis of vertebræ. Age 7 years. Duration one year. Showing angular kyphos.

Fig. 5.

Tuberculosis of vertebræ, showing lateral deviation to left. Age 13 years. Duration 7 months.

Fig. 6.

Tuberculosis of vertebræ: testing the hyperextension of the spine.

Fig. 7.

Tuberculosis of vertebræ, contracture of left psoas muscle from abscess. The right hip shows normal hyperextension. Age 11 years. Pott's disease for 4 years; abscess for 8 months.

Fig. 8.

Tuberculosis of the hip with abscess; head and neck of femur destroyed

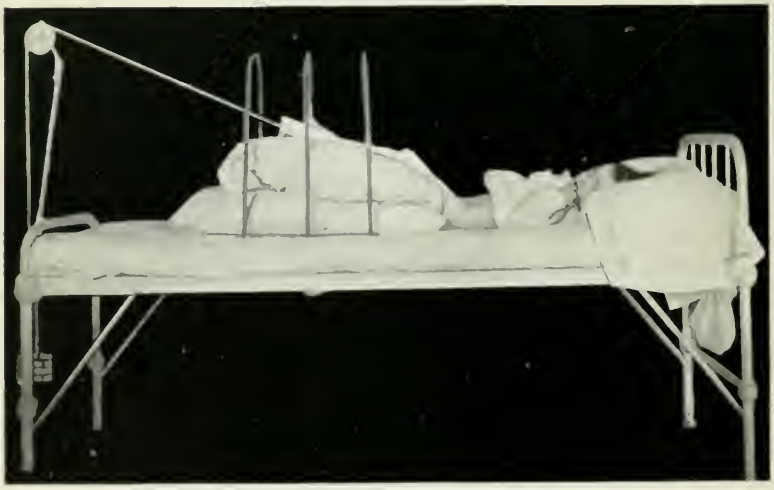
Fig. 9.

Bradford's gas pipe frame for treatment of tuberculosis of the joints in recumbency.

Fig. 10.

Roof garden with children in Bradford Frames; head and foot extension in the cases of vertebral disease.

Fig. 11.



Tuberculosis of left hip, with flexion deformity. The traction is applied in the axis of the deformity.

turn the child over on his stomach, and also in this position test the range of rotation in each hip by bending the knee and turning the limb in and out, and test for hyperextension by gently raising the flexed knee from the table; on the normal side the knee can be raised a hand's breadth or thereabouts from the table, whereas on the diseased side, where even normal extension is absent, it may be impossible to raise the knee at all. A confirmatory sign in tuberculosis of the hip which should not be overlooked is enlargement of the lymph-nodes along the external iliac artery.

In a case of suspected *vertebral tuberculosis,* first examine the child standing; have him bend forward as far as possible and note if on straightening up again he does so irregularly, by jerky movements, or easily and quickly.

Of course, a typical "hump" reveals the true nature of the disease almost at a glance; but the older the child and the more calcareous matter there is, therefore, in his vertebral bodies, the more will the development of the kyphos be delayed. In adults the kyphos may not appear for many months after onset of symptoms. A recent kyphos is sharp and angular in outline (Fig. 4); only after several years' duration does the hump become rounded. Seldom is there any occasion for doubt between a diagnosis of lateral curvature of the spine (scoliosis) and tuberculosis; but occasionally one sees a child in whom the tuberculous affection is confined to one side of a vertebral body, so that the whole vertebral column lists to one side. Such a *lateral deviation,* however, is not readily mistaken for a true lateral curvature (Fig. 5).

Proceeding with your systematic examination of a child suspected of having vertebral tuberculosis, have him sit on the table, with hips flexed as far as possible, and with his body bent down between his thighs as far as possible. Then note whether the curve of his spine is one long normal convexity, or whether any area of it lacks the normal curve. Next turn the child prone on his abdomen, grasp both ankles and gently raise both high in the air, noting whether the spine preserves its normal range of hyperextension (Fig. 6). Holding his lower body thus elevated by the feet, swing it gently from side to side, testing the lateral movements of the lumbar spine. Any lack of free movement in any region of the spine should make one suspect tuberculous disease. The mobility of the cervical and upper thoracic spine

is to be tested similarly, by gentle hyperextension of the neck and shoulders. Examination should also be made for abscess complicating cases of tuberculosis of the spine, since this may appear before any kyphos becomes evident. Palpation in the ilio-costal space may detect rigidity due to an early lumbar abscess long before bulging is apparent; and by the same means a psoas abscess often may be detected above Poupart's ligament before the pus has gravitated below this landmark, in the region on the outer side of the femoral vessels where it typically "points." Loss of hyperextension of the hip-joint, due to contracture of the psoas muscle, is an early and valuable sign; by bringing the child's pelvis to the edge of the table, as he lies on his back, and allowing both lower extremities to hang free, the contrast between the normal hyperextension of the hip on the healthy side and the persistent flexion on the side with psoas abscess will at once become apparent (Fig. 7).

Now, apart from the purely clinical diagnosis which has thus far been outlined, there are certain laboratory aids to diagnosis of which aid may be sought. The most important of these is, of course, the X-ray; this shows rarefaction and bone atrophy in the early stages; later also destruction and absorption of bone from weight bearing or pressure (Fig. 8). In most cases the X-ray appearance is sufficiently characteristic, when the history and clinical examination are taken into consideration, for a positive diagnosis of tuberculous disease to be made; but there are cases where the diagnosis from other low-grade infections, from bone cyst or even from sarcoma may not be very easy. And in the very early stages, where X-ray will reveal nothing that is characteristic, either because the disease is primarily in the soft tissues (synovia) of the joint, or because bone rarefaction and atrophy have not yet occurred; in the very early stages, I repeat, as well as in more advanced cases where a positive diagnosis seems difficult, resort to other laboratory examinations should not be neglected. The presence of syphilis usually may be excluded by a negative Wassermann test; and the Von Pirquet test or even the hypodermic test by tuberculin (O.T.) may be helpful in proving the tuberculous nature of the malady. If another tuberculous focus can be found (lungs, lymph-nodes), it is safe to conclude that the joint lesion also is tuberculous.

In cases where no satisfactory diagnosis can be reached the child

should be treated as if suffering from tuberculosis, and kept under observation until the diagnosis can be settled.

III. TREATMENT

Constitutional and hygienic treatment are quite as important in surgical as in medical tuberculosis. The majority of patients with surgical tuberculosis are children of a school-going age. It is better for them to give up school for one or two years, until their constitution is strong enough for them to conquer the disease than to attempt to keep up in their classes and grow physically worse and worse. You must not overlook the fact that it is better to have a healthy body with a stiff or deformed joint, than to have a straight and comely joint without a body capable of sustaining life. If the general health is good, joint function can be restored subsequently by operative means. It may not be possible for these patients to sleep in the open air, but they can at least sleep with all the windows in their rooms open, and be out-of-doors as much as possible during the day. In hospitals with suitable roof gardens and sun parlors it has been found that operative treatment is scarcely ever required. In institutions where for one reason or another it is impossible to keep bed-ridden patients out of doors constantly, it is at least possible for their beds to be wheeled out of doors and left out from morning until night. It is by no means necessary to have a hospital in the country for these patients; porches and balconies, even in the absence of roof gardens, will accomplish the same results in the most congested city districts.

Full, wholesome diet is equally important, and attention must be given to maintaining the appetite, regulation of the bowels and such intercurrent affections as may arise.

Local treatment may be summed up almost in one word: Rest.

Though the *modus operandi* of rest is not understood, a plausible theory is that suggested by Ely: he contends that cure is affected by abolishing joint function, because thus both red marrow and synovia become atrophic and in the case of ankylosis entirely disappear, and where these tissues do not exist, tubercle bacilli cannot live. This rest is obtained by *fixation* and *traction*. *Fixation* is secured by the use of splints, plaster cases, braces, etc., the sole object being to abolish motion at the diseased joint as effectually as possible. By *traction* is understood not so much actual extension on the limb sufficient to pull

the joint surfaces apart, as cessation of weight bearing and relief of pressure; in addition to relieving pain and securing rest, it also prevents deformation of the bone ends, which is prone to occur when weight bearing is continued. Traction is applied chiefly to the knee, hip and spine, fixation alone usually being sufficient in the upper extremity.

In all acute cases of tuberculosis of the spine and lower extremity the advantages of fixation and traction should be combined. This is best accomplished by bed treatment, so long as acute symptoms persist, regardless of the stage of the disease. In children the use of a Bradford frame, to which the body is strapped, provides fixation for spine, hip or knee, in the most efficient manner. This frame is made of gaspipe, and is covered with tightly stretched canvas (Fig. 9); it should be a little longer than the patient and as wide as from one arm-pit to the other. The child is fastened to it by a broad canvas apron covering chest and abdomen, or by straps crossing the shoulders. The frame thus becomes a part of the child, and the two together can be carried about from room to room, or ward to roof garden (Fig. 10), thus preventing the painful and harmful joint movements necessitated by carrying the child in the arms or transferring it to a stretcher and back again to a bed.

Traction is applied by the ordinary Buck's extension apparatus, and *always in the axis of the deformity* (Fig. 11); as muscle spasm lessens, gradual improvement in the limb's position may be secured.

When all symptoms of arthritis (limitation of motion from spasm, pain, fever, etc.) have been absent for two months or more, bed-treatment may be discontinued. This stage is reached in from two to six months in cases coming under treatment in the early stages of the disease. If, now, you recklessly discontinue local treatment (rest and fixation) in the erroneous idea that the joint is cured, and if the patient is allowed to resume joint function, it will be only a few weeks before symptoms of arthritis return and possibly in aggravated form. It is absolutely imperative to guard the joint against injury and strain by continuing for a long period fixation or traction or both during ambulatory treatment.

By the use of plaster-of-Paris, braces and crutches, both fixation and traction (in modified forms) can be continued; and this should be done until, by allowing gradual return of function (first limited

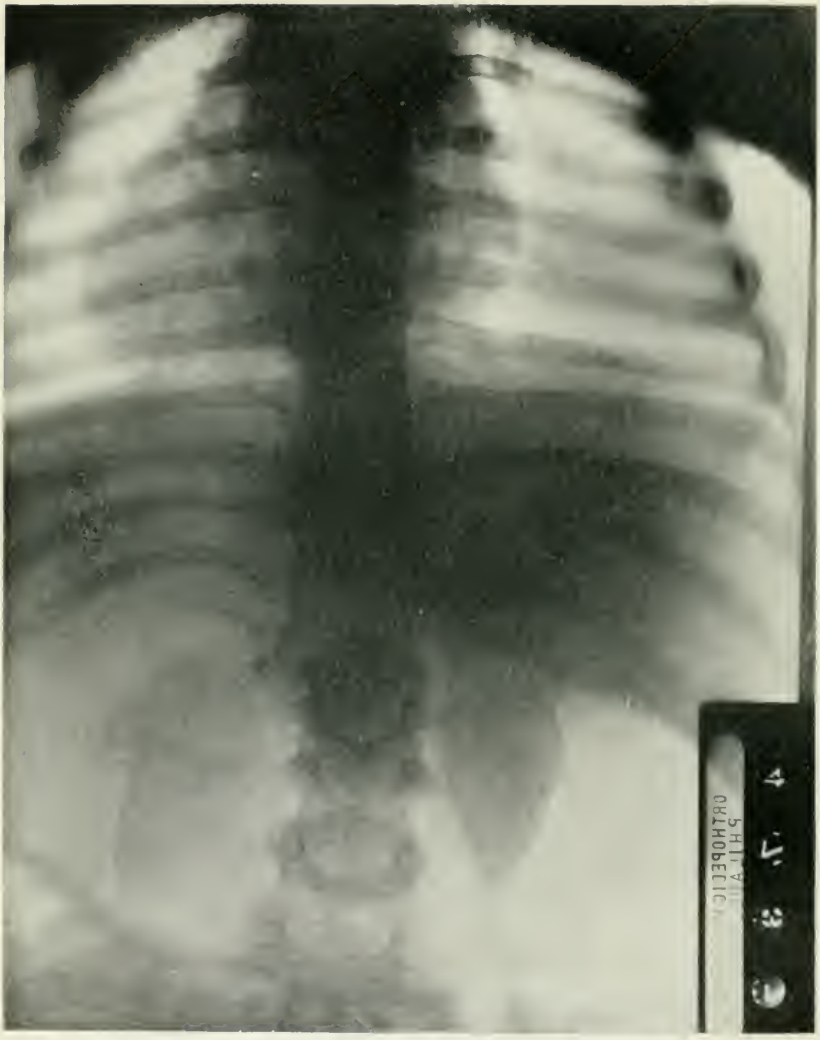
Fig. 12.

G. G. Davis's traction brace for tuberculosis of the hip. A high shoe is worn on the healthy (left) side, and the brace extends as a stirrup beneath the shoe of the diseased side; at each step the patient *sits* on a bar which passes beneath the tuberosity of the ischium, while the limb hangs free from pressure.

Fig. 13

G. G. Davis's brace for tuberculosis of the upper thoracic or cervical spine. A band around the pelvis affords fixation below; the shoulders are suported by crutch-heads attached to side-irons. A jury-mast supports a sling beneath the chin and around the forehead.

Fig. 11



Bilateral psoas abscess (calcified) in an old case of tuberculosis of the lumbar vertebræ.

Fig. 15

Sinus in a case of tuberculosis of the hip, injected from the opening on the outer surface of the thigh above the knee. Age 10 years. Sinus for 3 months; uneventful healing. In good health, with ankylosis of hip, 4 years later.

Fig. 16.

Tuberculosis of lumbar vertebræ. Age 4 years.

motion, then weight bearing), the surgeon proves that the joint lesion has become so thoroughly encapsulated as not to be liable to cause recrudescence of the disease (Figs. 12 and 13).

This period of ambulatory after-treatment extends always through months, sometimes for years. Only by making haste slowly can permanent good results be achieved.

Treatment of Cold Abscess.—If the joint be put at rest, and the patient kept in the open air, the threatening abscess may cease to enlarge and may gradually disappear (Fig. 14). If in spite of these conservative measures the abscess continues to enlarge and threatens to approach the skin, with the consequent danger of infection from the skin cocci, even before rupture makes such an infection sure, you will find it safer to expose the abscess wall by careful dissection through the overlying healthy tissues, swab these with 3 per cent. iodin, evacuate the contents of the abscess and wipe its cavity dry with iodoform gauze. The incision to reach the abscess is then sutured in layers, without drainage. Often the operation may be done under a local anæsthetic. In many cases the incision heals without breaking down at any point, and in only a few does the abscess refill and require a second evacuation. Should the incision break down, it will nevertheless usually heal by granulation. It is dangerous to leave a cold abscess alone until the overlying skin has become adherent and reddened, since secondary infection is then very frequent, and rapid joint disintegration, hectic, amyloid disease, etc., follow; and it is still more dangerous to open a cold abscess without perfectly aseptic technic, or to drain it by tube or gauze after incision, or to allow it to discharge itself spontaneously.

But sometimes the patient is not seen until spontaneous rupture threatens and secondary infection is already present. Then the abscess should be evacuated by a puncture where it is pointing, but should not be drained; if the puncture is occluded by aseptic gauze, in many cases little or no subsequent discharge will occur, the "hot" will gradually resume its character of "cold" abscess, and eventually may be absorbed. Thus the formation of sinuses and prolonged suppuration may be prevented.

Aspiration of a cold abscess, I believe, is inferior to formal incision, because it cannot be done satisfactorily until the pus is very close to the surface and unless it is very fluid.

Treatment of Sinuses.—Sinuses nearly always indicate secondary infection. If no secondary infection is present (a fact which cultures of the pus will demonstrate), they usually will heal under rest and constitutional treatment. Exposure to the sun's rays or on cloudy days to artificial light encourages healing of tuberculous sinuses. Incandescent bulbs may be suspended from a cradle over the patient's bed, and nearly constant exposure thus be provided for. Direct sunlight must be used cautiously at first to prevent sunburn. If the sinuses fail to heal and the discharge of pus is not profuse, they should be filled with Beck's bismuth paste (Fig. 15): one part of bismuth subnitrate (arsenic free) to two parts of sterile amber vaseline. This is heated on a water bath until fluid, and is injected under pressure into the sinuses by a glass syringe, which, after being boiled, is rinsed in alcohol and allowed to become thoroughly dry before it is filled with the liquid paste. Skiagraphs made after the injection will demonstrate the origin and ramifications of the sinuses. If the sinuses are very large, it will be safer to use only a 10 per cent. bismuth paste, instead of Beck's original formula, for fear of bismuth poisoning.

If profuse suppuration persists in spite of conservative measures, and particularly in cases of long-continued hectic, the sinuses should be opened freely, and any sequestra should be removed. Such sequestra, though usually very small, as well as carious bone, form favorable sites for the development of saprophytic bacteria, and if the pabulum of the latter can be removed, the hectic fever may be checked.

Operative Treatment.—In children it is only in the class of cases just mentioned that operations, such as excision of a joint, are required. But in cases of tuberculosis of the vertebræ, bone transplantation may well be adopted for the purpose of providing internal fixation, and thus arresting the disease (Figs. 16, 17, 18 and 19). But under the age of six years I believe this operation is usually inadvisable, as being neither positively indicated nor so certain in its results as in older children and adults.

Treatment of Deformities Following Tuberculous Arthritis.—Many patients who have been inadequately treated, and some in spite of the best treatment, develop in the course of years certain deformities which also are positive disabilities. For these it is possible to do much by operative surgery. But you should always bear in mind

Fig. 17.

Same patient as Figs. 16, 18 and 19, after bone transplantation.

Figs. 18 and 19.

A girl, aged 4 years, with tuberculosis of lumbar spine (Figs. 16 and 17). Showing the hump, on admission; and the result of bone transplantation, after the deformity had been corrected by recumbent treatment

Fig. 20. Fig. 21. Fig. 22.

Ankylosis of right hip in flexion deformity, the result of tuberculosis. Fig. 20. shows the extreme lordosis on attempts to bring the foot to the ground. Fig. 21. shows the lordosis corrected, but the hip nearly at a right angle. Fig. 22. shows the result of osteotomy of the femur below the trochanters. Though the hip is still ankylosed the disability has been greatly lessened by correcting the deformity.

that there is a possibility of lighting up again the old infection, and should consider well whether in the first place the patient's disability is so pronounced as to demand relief and also whether the means of relief proposed are reasonably certain and adequate. Mere stiffness of a joint cannot be considered an indication for operation so long as it entails no particular disability. Ankylosis is the best and surest cure of tuberculous arthritis, and except in the elbow or shoulder usually should not be interfered with. In both shoulder and elbow, particularly the latter, excision gives admirable results with free motion. But in the lower extremity unless the ankylosis is in bad position it should not be disturbed; attempts to restore motion are not apt to be very successful, and stability rather than movement is desirable in the hip and knee. Ankylosis at the hip in bad position may be successfully treated by subtrochanteric osteotomy of the femur, the position of the limb being improved, but ankylosis being preserved (Figs. 20, 21 and 22). Deformity without ankylosis at the hip may rarely be improved by cautious correction under an anæsthetic, but usually, and especially is this so if there is pathological dislocation of the hip, an open operation will be required, with replacement of the end of the femur in the acetabulum, an effort being made to convert the flail and helpless limb into one capable of supporting the patient's weight.

So you see that the "cure" of tuberculous bone and joint disease is a long and tedious process; that the motto "*principiis obsta*"—resist the beginning of the disease—is true especially of this form of surgical disease, and that the only way in which treatment can be adopted early enough to be really efficient is by making the diagnosis without unnecessary delay. I have tried, therefore, to explain to you how the diagnosis usually may be made merely by thorough and systematic physical examination, and I hope you will bear in mind that it is your duty as pediatrists to recognize these cases, and if you are not surgeons yourselves, with mechanical tastes and with proper facilities at your command, I beg you to refer your patients with tuberculous bone and joint disease to hospital services where proper treatment may be promptly instituted and conscientiously continued as long as may be necessary.

INTERESTING TOPICS OF CLINICAL SURGERY

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I. The Evolution of Hæmatic Cysts of the Spleen.
II. The Diagnosis of Acute Perforation of Duodenal Ulcer.
III. The Diagnosis of Typhoid Spondylitis.
IV. Cancer of the Male Breast.
V. Osteoma of the Orbit.
VI. Gonorrhœal Myositis and Myopathy.
VII. The Correct Operation for Paraphimosis.
VIII. The Technic of Nerve Suture and Nerve Anastomosis.

I. THE EVOLUTION OF HÆMATIC CYSTS OF THE SPLEEN

The evolution of a hæmatoma into an hæmatic cyst being an accomplished fact, the question arises as to the nature of the phenomena giving rise to the hæmostasis following trauma of the spleen, and in what circumstances a laceration of the organ results in a localized hemorrhage rather than a diffuse loss of blood usually fatal. In the first place, the violence and intensity of the traumatic action must be considered, and it will often be observed that the traumatic force was so very slight that it may have passed unnoticed. In these cases you will never have a history of major abdominal traumata, with crushing of the spleen, etc. That is the first point to remember.

Certain conditions limit the extent of the hemorrhage and prevent the blood from becoming diffused in the abdominal cavity, and in this respect the capsule of the spleen plays a considerable part as a mechanical agent. It is uncommon for the fibrous capsule to rupture, and this resistance of the capsule is quite in opposition to the softening of the splenic pulp, which becomes friable and diffluent during paludism. Malaria causes the capsule to become thickened by a process of sclerosis, and, therefore, it acquires a greater solidity, so that there is a double process taking place, namely, an increased resistance of the capsule and friability of the splenic parenchyma, conditions which favor the development of hæmatic cysts.

Any action on the part of the splenic envelop cannot be invoked

when its rupture has taken place and allows the blood to fill the splenic lodge, so that when encystment of the blood does occur it is probably due to the presence of tough, solid adhesions developed from a malarial spleen of some years standing, when they are located near the site of the tears in the capsule. They would require considerable force to break them down, so that the pressure exercised by the blood collection has no effect upon them and becomes encysted independently from the abdominal cavity. Whether or not this be so, or whether the adhesions are the consequence of the splenic hæmatoma, I am quite prepared to say that when there is a *splenic hemorrhage following upon a very slight trauma,* the blood has a remarkable tendency to collect and become confined to the splenic lodge, and now, for the understanding of the subject, I must tell you what is meant by the splenic lodge.

In 1889, Constantinesco described with much detail, under the name of splenic lodge, the gastro-diaphragmatic interstice in which the spleen is enclosed and which, in reality, is merely the left extremity of the gastric fossa. Thus understood, the splenic lodge is composed outwardly, behind and in front by the diaphragm, which, after having described its dome, takes its insertion on the thoracic walls. Inwardly, it is formed by the postero-external wall of the stomach, while its floor, distinctly inclined from above downwards and from behind forwards is represented from behind forward by a portion of the external aspect of the left kidney and suprarenal, by the transverse colon which continues with the portion of the peritoneum covering the kidney and with the lateral abdominal parietes. Other than for the kidney this same floor is solely composed by that part of the mesocolon which extends from the colic angle to the lateral abdominal parietes and bears the name of left phreno-colic ligament.

The splenic lodge in front opens freely into the peritoneal cavity, so that blood accumulating in the splenic lodge will become the more readily confined to this region. The mere contraction of the abdomen tends to close it in front, causing a rather complete occlusion. To conclude: It must be admitted that certain conditions come into play in controlling the hemorrhage and confining the blood to the lodge in question. The first is the part played by the splenic capsule which, when intact, is enough to offer an efficient barrier to the blood and consequently walls off the hemorrhage. When once formed, the hæma-

toma may undergo absorption—a rather frequent evolution. In other cases it becomes encysted and by organization of the clot and a process of adhesive peritonitis adhesions are developed. They are soft at first, then fibrous, and by encapsulating the hæmatoma a perisplenic hæmatic cyst is the result.

There is one point to which I wish to direct your attention, namely, the way in which a perisplenic hæmatocele is produced. This process is sometimes primary from its onset and also is a consequence of rupture of a large subcapsular hæmatoma. If the evolution of a hæmatoma into a hæmatic cyst is easy to understand, there are other cystic processes of the spleen whose pathogenesis is still obscure. These *true* cysts in opposition to hæmatic pseudocysts offer as an important character a membrane whose internal surface is lined with endothelium. It is not by the contents of the cyst that a distinction can be made between hæmatic cysts and serous cysts of the spleen, but rather by the presence of an endothelial lining. There are hæmatic cysts whose contents, at first distinctly hæmatic, finally undergoes chemical changes becoming clear and transparent and inversely, a vascular rupture may occur in the cavity of a serous cyst and the rather profuse hemorrhage resulting will impart the characteristics of blood to the fluid contents.

A number of years ago Dr. John Musser, of Philadelphia, gave to serous cysts of the spleen the following pathogeneses, which, I think, should be carefully considered and remembered: First, the cyst may be due to the transformation of a hæmatoma resulting from traumatic or spontaneous rupture of a splenic vessel, the solid parts of the blood become deposited in strata on the cyst walls, while a clear fluid forms the contents. Secondly, these cysts are due to the development of a lymphangioma. An invagination of the peritoneal endothelium takes place and will be the starting-point for the formation of a cyst. The cyst may be the consequence of a localized softening of the splenic parenchyma following occlusion of a degenerated vessel—amyloid degeneration in Kopyloff's case. And, lastly, a splenic cyst may develop by the following mechanism: Rupture of the capsule, protrusion of the parenchyma, occlusion of the cavity thus produced and development of the cyst.

I here place before you a table which shows the differences existing between the two principal varieties of cysts of the spleen.

Hæmatic Cysts	True or Serous Cysts
1. Infrequent.	1. Excessively rare.
2. Always single.	2. Single or multiple.
3. Always superficial; subcapsular or perisplenic.	3. Superficial, sometimes intraparenchymatous, increase the size of and deforms the spleen.
4. Always large in size, containing from eight to ten litres of fluid.	4. Varying in size from a walnut to a turkey's egg. The size is inverse to the number of cysts present.
5. Quite regular in shape when subcapsular. When perisplenic they assume the shape of the distended splenic lodge.	5. More or less bosselated.
6. Invariably unilocular.	6. Either uni- or multilocular.
7. Walls composed of very dense fibrous tissue, large vessels may exist over the external surface of the cyst to which they intimately adhere.	7. Walls composed of shiny white or ecchymotic membrane, very vascularized and lined by a pavement endothelium.
8. Microscopically, contents composed of blood or sero-sanguineous; contains fibrous particles and débris of splenic parenchyma. Liquid thick, occasionally rather limpid.	8. Microscopically, contents serous or sero-sanguineous; no débris or splenic parenchyma. Liquid limpid, occasionally rather gelatinous or viscous.
9. Complex composition of liquid contents. Red blood corpuscles more or less altered. Leucocytes, cholesterin crystals, mineral salts, urea, blood granules, sp. gr. 1030 or thereabouts.	9. Simple composition of liquid contents found in ordinary cysts. Solid residual matter, albumin, red blood corpuscles, leucocytes, cholesterin crystals, sp. gr. 1010 to 1020.
10. Evolution: stationary for a long time. Begins to grow suddenly and growth may be very rapid.	10. Evolution: progressive growth and after a certain length of time becomes rapid.
11. Pathogenesis: encystment of a hæmatoma.	11. Pathogeneses: (*a*) *Lymphatic origin* = ectasis (Aschoff, Kühne) or lymphatic neoformation (Otto, Finck). (*b*) *Inversion of the peritoneal endothelium*, from (*a*) rupture of the spleen (Beneke, Randohr) or (*b*) an embryonal inflammatory factor (Renggli, Ribbert), post-embryonal (Kühne).

The diagnosis of hæmatic cysts of the spleen is clearly a matter of considerable difficulty, as you may readily surmise, and will be based upon the site and characters of the cystic tumor which develops *sometime after the receipt of some mild trauma over the splenic area.*

The treatment is surgical and as conservative as circumstances will permit. Simple incision and drainage of the cavity or partial

or total excision of the cyst when subcapsular and not adherent should be resorted to. When the spleen is found to have undergone very marked morbid changes splenectomy must be done.

II. THE DIAGNOSIS OF ACUTE PERFORATION OF DUODENAL ULCER

The diagnosis of perforation of an ulcer of the duodenum is difficult and, in most cases, given the serious abdominal symptoms, you will hesitate between a visceral perforation of some sort—appendicitis, acute occlusion, hepatic colic or acute pancreatitis. Of all these diagnoses the modern medical man will probably be more inclined to that of appendicitis for the very good reason that this morbid process is so common in practice. I well remember the day—not so very many years ago—when the multiple aspects of appendicitis were not well known—when the diagnosis of intestinal occlusion was fairly common even among experienced surgeons, their opinion being based upon the pain, vomiting and cessation of the passage of fæces and gas. Now, gentlemen, Darras collected twenty-three cases of duodenal perforation in which the diagnosis of occlusion was made in nine and that of appendicitis in six, but this was some years ago, and at present such mistakes should not be made.

However, an erroneous diagnosis of appendicitis will, nevertheless, still be made and is excusable in some cases, and even Moynihan has recorded forty-nine instances of duodenal ulcer, nineteen of which were regarded as appendicitis. What is important for you to remember is that perforation of a duodenal ulcer will be all the more readily recognized the earlier in the progress of the process the patient is seen. Later on the major signs of perforation are veiled by those of peritonitis, which undergoes its evolution with frightful celerity.

From the viewpoint of the diagnosis, three phases in the evolution of the symptoms of duodenal perforation can be conveniently made. In the first you may have the good luck to be called to the case at its very onset, when the symptoms first appear; or it may be later, when the first phase has passed by—and it may and probably will be of very short duration—and the symptoms have become localized in the iliac fossa, while if you see the patient in the third, or terminal, phase, you will find that the peritonitis has extended throughout the abdomen, the patient presenting all the signs of septicæmic intoxication that goes with it.

In the first phase there are four signs most important to remember, as they overshadow all else. These are: the case history, pain, sensitiveness to pressure and rigidity of the abdominal parietes. The importance of obtaining a correct history of the case is paramount, because you will usually find that the patient has been troubled by some digestive symptoms in his past, although a number of competent observers, for reasons which I cannot account for, have maintained the contrary, but when you cannot elicit digestive disturbances in the patient's antecedents, such as pain coming on several hours after a meal or only pyrosis, then it is because you have not questioned the patient or his family carefully. But when you have obtained a history of past gastric symptoms, this will materially aid you in the diagnosis of the perforation.

The atrocious pain of perforation attains its maximum then and there, and has been regarded a pathognomonic sign, and I remember that Dieulafoy was inclined to base his diagnosis mainly upon a study of this symptom. Rigidity of the abdominal parietes is a symptom common to all sorts of visceral perforation and no other morbid process within the abdomen can produce it to such an extent, and I am even prepared to go so far as to advise you to open the abdomen at once upon the strength of this sign alone.

The sensibility to pressure should be sought for gently and with the utmost care, and in proceeding with this part of your examination always have in mind the topography of the tender spots encountered in other acute abdominal affections. Such are the clinical signs to be found at the onset of the perforation of a duodenal ulcer, and I shall next review other conditions in which they are to be found with more or less distinctness.

In perforation of a gastric ulcer the same history will be obtained as in the case of the duodenal variety—sudden onset with fearful pain seated at the upper part of the abdomen, a hard retracted abdomen but no vomiting at the beginning and little change in the pulse or temperature. But here is a differential diagnostic point: the pain develops shortly after eating in gastric ulcer, from one to three hours in duodenal perforation. Pain is relieved by the ingestion of food in duodenal perforation and greatly increased in gastric perforation.

In perforated gastric ulcer the pain will be found high up in the middle line, while in duodenal perforation it is manifest more to the

right of the midline and from here radiates to the right costal border, thorax and back of the same side. In gastric perforation the pain extends to the left side of the thorax and costal border, sometimes to the left arm. In both cases hemorrhage may take place, and, although hæmatemesis may occur in duodenal perforation, it is almost always constant in perforation of the stomach. Melæna occurs in both. The previous digestive disturbances are intense in gastric ulcer, while in the duodenal lesion they are less obvious and do not prevent the patient from eating heartily. The influence of sex is not to be overlooked by any means, since the ratio of duodenal ulcer is one in the female to four in males. Gastric ulcer is far more common in women, as you know.

The differential diagnosis with appendicitis unquestionably presents some difficulties, but if you see a perforated duodenal ulcer *very shortly after the onset of the symptoms,* I think you should make it. In both the first symptom is a violent acute pain starting on the right side and soon involving the entire abdomen, but if you are keen in your examination you will note that this pain does not begin in the same way in each. In ulcer of the duodenum it occurs suddenly, and at once reaches its summum, while in appendicitis it progressively gets worse. The pain in duodenal perforation is above the umbilicus, starting in the gastro-hepatic area, while that of the appendix begins around the umbilicus or over McBurney's point. Do not, however, lose sight of the fact that the anatomical situation of the appendix is very variable, so that the site of the painful phenomena to which it gives rise when inflamed vary considerably. The rigidity of the abdomen extends over the entire abdomen in perforation of the duodenum and is far more marked than in appendicitis, whose area of abdominal rigidity is most apt to be confined to the right iliac fossa.

Acute pancreatitis, on account of the sudden onset of its symptoms, as well as their intensity, may be mistaken for perforation of a duodenal ulcer. In the former process there is a tendency to collapse, which is very uncommon in duodenal perforation. The pain of acute pancreatitis is in the epigastrium and the abdominal rigidity and cutaneous hyperæsthesia will be found here. The pulse is distinctly bad in the pancreatic process, being weak, rapid and hypotensive. Recall that this affection is more frequently observed in corpulent

individuals and pregnant women. Both morbid processes demand immediate surgical interference.

I do not believe that perforation of the gall-bladder can give cause for a mistaken differential diagnosis with perforated duodenal ulcer; its symptomatology is much more subdued and pain or pressure much more localized. Rupture of an ectopic gestation or an acute salpingitis need not be considered in the diagnosis, but you must never neglect to invariably make a thorough bimanual examination in every woman who presents a peritoneal reaction. Just as a matter of curiosity, I would say that twice a case of diaphragmatic pleurisy was mistaken for a perforation of a duodenal ulcer by very good surgeons, and if my memory does not fail me, I believe they were the late Maurice Richardson, of Boston, and Barnard, of England. I mention these instances merely to show how the very best and experienced men may err, and this will be far more likely to occur among physicians who do not take the trouble to reflect and analyze the symptoms presented by the patient.

You understand that I have been referring only to the early phase of perforation—the onset of the symptoms—and it is very short, as the progress of the accidents is very rapid, so that the symptomatology changes quickly. After the acute onset a period of *apparent* improvement takes place, lasting for several hours; but do not let this deceive you, because soon the right iliac fossa will become the seat of symptomatic phenomena, likewise the pelvis; the infection continues its progress and if the physician has not seen the case at the onset of the symptoms, or if these are overlooked in taking the case history, a mistaken diagnosis of appendicitis will be practically inevitable. From the fact the pain in both perforation of duodenal ulcer and that of appendicitis is located on the right side of the abdomen and especially in the iliac fossa on that side the diagnostic error may be excusable, all the more so because this board-like rigidity of the abdominal walls will have subsided to some extent. But it seems to me that if you will take heed of what I have told you about obtaining a correct history of the patient's previous dyspeptic disturbances, as well as the onset of the acute manifestations, you will not go very far from the mark.

At the terminal phase the entire peritoneal cavity will have become involved so that a diagnosis is yet more difficult to make. A

diagnosis of peritonitis will naturally be made, but the causal factor of its production will, in most cases, escape you until the abdomen is opened.

III. THE DIAGNOSIS OF TYPHOID SPONDYLITIS

The diagnosis of typhoid spondylitis will present itself to you in practice in two very different conditions. Sometimes the symptoms of spondylitis will appear during the height of or the regression of the typhoid process treated and diagnosed as such; at others the symptoms of the spondylitis will appear at a later date, when the causal typhoid fever may be an unknown quantity to you, unless by questioning the patient you find it in his antecedents.

When the spondylitis appears during the typhoid the diagnosis is an easy matter when you know the symptoms of the affection and its clinical characters. I have not now in view those cases where the intensity and distinctness of the process are such that a diagnosis is actually forced upon the medical attendant, but rather the milder cases with a quieter onset. The presence of pain, either in the lumbar region or lower limbs, should lead you to make a methodical examination of these parts, to be completed by a radiographic examination, and should you follow this advice you will be able to attribute the various indefinite pains of typhoid fever to their real source, namely, a spondylitis.

Numerous, gentlemen, are the affections for which our unrecognized spondylitis may be mistaken. Vulgar lumbago only gives rise to muscular pain exclusively, without extension down the lower limbs. The pain is sharp undoubtedly, but usually it can be rapidly overcome by proper treatment; there are no painful spots over the bone, and if there is any elevation of the temperature whatsoever, it does not amount to anything. Rare in typhoid fever, this morbid muscular phenomenon may be the first symptom of a vertebral lesion that it shall be your duty to detect.

The same may be said of intercostal neuralgia or lumbo-abdominal neuralgia, both exceptional in typhoid, but the pain of typhoid spondylitis may often simulate sciatic neuralgia; continued pain with paroxysms, painful radiations starting from the lumbar region to the lower limb and following the track of the sciatic nerve quite closely, and when pressure is made over this nerve trunk pain will be com-

plained of. A detailed analysis of the symptoms will show you that usually the differences are very marked; the extreme intensity of the pain rarely commences at the very onset of ordinary sciatic neuralgia. On the other hand, in spondylitis the pain is not distinctly confined to the track of the sciatic nerve and is more diffuse along the lower limb.

In a somewhat intense sciatic neuralgia you will *always* find Valleix's points sensitive; in spondylitis, regardless of the intensity of the pain, the points will *not usually* cause any uneasiness to the patient when pressure is made over them, and if pain can be elicited over the upper points, especially the retrotrochanterian, the femoral, fibular, etc., points will be absent. Lasègue's sign is absent, but when mobilization of the thigh on the pelvis is possible it will be invariably painful, no matter what position the leg assume in relation to the thigh. When these movements are made, the spine is always mobilized and being the seat of the pain causes the patient's distress.

Now, although a scoliosis exists in sciatica, it must not be forgotten that homologous scoliosis is the exception; generally speaking, the concavity faces the opposite side of the involved limb, and in order to obtain relief the patient displaces the centre of gravity towards the normal member by assuming the haunched attitude. In spondylitis the scoliosis is homologous, the concavity facing towards the painful limb.

I have, so far, been speaking only of unilateral sciatica; in spondylitis the painful phenomena are, in reality, almost always confined to one side or at least they are more distinct on one side, and this is a new argument in favor of the diagnosis, because the true sciatica of typhoid usually is a consequence of bilateral neuritis. And, as a last resort, the existence of disturbances of the sensibility—anæsthesia, hypoæsthesia, hyperæsthesia—having a distinctly radicular topography, will cause you to eliminate the diagnosis of truncal sciatica and in its stead place the condition in the class of radicular sciatica, which agrees with the other symptoms, and then you will turn your attention to the roots to discover the cause of the symptoms observed. It is more than likely that if more careful examinations were carried out it would be found that a number of so-called sciaticas found in typhoid are, in reality, symptoms of spondylitis.

Pain and contracture might lead you to suspect a psoitis, a process

not exceptional in typhoid, but the position of the limb is absolutely characteristic and so different from that assumed in spondylitis that I do not believe you would hesitate a minute. In the former process it is strongly flexed on the pelvis in external rotation with the thigh immobilized, while in spondylitis, on the contrary, if you proceed with gentleness, it will be found that extension is possible and that the psoas is not contracted. In psoitis, palpitation of the iliac fossa reveals a deep, painful tumefaction, often of considerable size.

Let me mention two other rare localizations arising in typhoid, but whose diagnosis will be easy for anyone who carefully examines his patient. I refer to acute coxo-femoral and sacro-iliac arthritis. In the former the hip-joint is soon immobilized in the characteristic attitude of the thigh flexed in internal rotation, the pain seated directly over the point, the psoas contracted. A tumefaction is frequently detected in the region of the joint and pressure on the great trochanter provokes a sudden sharp pain in the joint.

In sacro-iliac arthritis, the seat of the spontaneous pain is sometimes difficult to exactly locate, but a search for the painful spots by palpation and digital rectal examination shows distinctly that the maximum of pain is over the articular interline, following it from above downward. If you place your hands on each of the iliac crests and then attempt to force them towards the median line, a very sharp pain immediately results, the patient localizing it precisely in the joint. There may be a slight degree of tumefaction over the joint as well.

Finally, I would mention typhoid osteitis which, when it is seated in the iliac bones or in the lower ribs, might, perhaps, lead to confusion in the diagnosis. At the onset the bone is painful and tumefaction arises later, while the data derived from radiography will eliminate the hypothesis of spondylitis.

In all these various diagnoses it is a careful search for the vertebral points of pain over the spinous apophyses, the transverse apophyses and bodies of the vertebræ that will show that the spine is the seat of the trouble and explain the cause of the phenomena observed. It seems to me superfluous to insist upon other affections which were at first mistaken for spondylitis, such as gastric ulcer, appendicitis, abscess or infarct of the spleen cholecystitis or pyelonephritis, but such errors have been reported.

The intensity or predominance of certain nervous symptoms, such as an exaggeration of the patellar or tendo-Achilles reflexo-epileptoid trepidation and sensitive disturbances when superadded to the painful spine have been known to be mistaken for meningitis or myelitis, rare complications of typhoid fever, but which do occasionally arise. In these circumstances, lumbar puncture will settle the diagnosis, because whenever it has been resorted to in typhoid spondylitis the cerebrospinal fluid has usually been found normal, although in one case there was hypertension, and an increase of the albumin, but without cell reaction, a syndrome which Sicard has shown to be related to Pott's disease.

In some rather rare cases in which the osteo-articular symptoms in the spine have developed silently, fever having preceded the pain, a relapse of the typhoid might be considered probable, but soon the true state of affairs will be recognized by the absence of the symptoms, while negative hemoculture shows beyond a doubt that there is a local complication and not a septicæmia process. Blood examination revealing a polynuclear leucocytosis likewise points to a local inflammatory process in progress.

The presence of painful spots over the spinous apophyses of one or several vertebræ, as well as over the lateral and anterior surfaces of these same vertebræ, muscular contracture, scoliosis, various nervous disturbances varying with each case, leave no doubt as to the existence of some vertebral lesion, the cause of the visitation or radiculo-medullary compression. Pott's disease will at once occur to you, because the majority of vertebral osteo-arthritides are due to tuberculosis and Pott's disease may very well develop in convalescence from typhoid fever, but independently of the ulterior evolution, from the very onset the process offers a very special symptomatology; the onset is sudden, the immediate or rapidly increasing intensity of the painful phenomena, signs of compression and fever do not chime in with the usual clinical aspects of vertebral tuberculosis.

In Pott's disease with a sudden onset which is more like spondylitis, radiographic examination will reveal the existence of already extensive lesions—vertebral caries, never hyperostosis—showing that the sudden onset of the process was only apparent and that the new symptoms are only the consequence of a long-standing vertebral lesion. On the contrary, in typhoid spondylitis, an early radiographic exam-

ination either will reveal no lesion whatsoever, or will show the very special changes taking place in the intervertebral disc and perivertebral tissue. For that matter, the evolution will oblige you to reject the diagnosis of tuberculosis of the spine as a complete and often rapid cure after a short immobilization is never met with in this affection when it has reached the stage of such accentuated symptoms.

It is, consequently, the etiology, the fact of witnessing this symptomatic complex of spinal osteo-articular involvement and radiculomedullary manifestations during the evolution of an undoubted case of typhoid demonstrated to be such by hæmoculture and Widal's reaction, repeated, if necessary, at the time of the onset of the symptoms that should guide you in your diagnosis of typhoid spondylitis. The hypothesis of a lesion of the spine resulting from secondary infection will always remain to be demonstrated, but you must likewise know that during convalescence from typhoid spondylitides are met with which are in no way related to the typhoid bacillus infection. Such are the vulgar vertebral osteomyelitides due, for example, to the staphylococcus.

Now, if we consider the cases in which the spondylitis arises late after convalescence has taken place or when a past typhoid fever is unknown to the physician in a patient consulting him for vertebral pain, a diagnostic error is most apt to occur, regardless of the distinct points of pain over the spine, the signs of compression and other symptomatic anomalies of spinal caries, and vertebral tuberculosis will be his verdict. But these very anomalies should attract your attention and call for a careful clinical history and antecedents of the patient. The notion that there has been a former pyrexia and the data that may be obtained from the patient as to the character of the fever, the existence of certain non-pathognomonic symptoms, but which are frequently observed, such as falling out of the hair, may stimulate your minds in the direction of a retrospective diagnosis of typhoid.

It is in just such circumstances that, to my mind, Widal's reaction acquires its maximum importance, since agglutination has invariably been found in high percentages—1/50 to 1/200—figures that are exclusively met with in subjects yet in a period of infection or whose convalescence is not remote.

I need not revert to the clinical diagnosis with Pott's disease; ver-

tebral syphilis, cancer or actinomycosis need not detain us, as their evolutions are absolutely different from the most prolonged cases of typhoid spondylitis. Some of the acute primary inflammatory processes of the spine present an easy diagnosis. In vertebral osteomyelitis—an otherwise rare affection—the local phenomena are intense and usually a local œdema, sometimes extensive, will be found over the involved region and is rapidly replaced by the signs of a purulent collection. The extreme gravity of the general symptoms and rapid evolution of the process will never lend confusion with typhoid spondylitis.

Acute rheumatic osteo-arthritis of the spine is rarely encountered by itself, as other joint foci will be present in the patient. As to other spondylitides, when they are not distinctly secondary to an infectious process, such as pneumonia, scarlet fever, measles, etc., it will be impossible to clinically affirm their nature and of all, from this viewpoint, typhoid spondylitis is the best known. Upon an early diagnosis of typhoid spondylitis depends an early treatment with a plaster corset and continued extension, whose excellent therapeutic effects will soon be apparent, especially in the control of pain.

IV. CANCER OF THE MALE BREAST

Before describing the various clinical manifestations offered by the majority of male patients with cancer of the mammary gland, I would direct your attention to the predilection, if any, of the process to develop in one side or the other the averages of the patients' ages and also, if among the various etiological factors invoked there is one that appears to be more acceptable than the others. It is difficult for me to offer you any precise opinion on these points, and I believe that most men of experience will agree that a "too sure" attitude is ill-advised when we take into consideration how much there is yet to learn on the subject of malignant disease in general.

If we look over a few statistics taken at random, it will be found that Horteloup found cancer of the left male breast seventeen times as against thirteen on the right. In Poirier's statistics the left breast was the seat of the neoplasm twenty-three times and the right thirteen times, while in one case the growth was bilateral. Williams' statistics give thirty-eight cases on the right, thirty-three on the left and in four the disease occurred in both breasts. Imbert has noted a rather

marked predilection for the right breast because he has been able to collect sixty-four instances as against forty-eight in the left breast. Delacour has had four cases, two in the right and two in the left male breast. Collignon has recently collected nine more cases, four being in the left and four in the right breast, while the ninth case is of great interest, inasmuch as it was a bilateral adenosarcoma. If we add the above figures it will be found that the right breast was involved in only thirteen more than the left, the total number of cases being 266 cases. I therefore feel inclined to admit that there is no special predilection for a malignant growth of the male breast to develop in one or the other.

It is, I believe, recognized that the cancerous period in male subjects is rather longer than in women. In women the disease is not common after the age of sixty, while in males it is not uncommon up to the age of seventy. Laforgue, after having compiled the statistics of Poirier, Friedler, Strassmann and Bolhagen, concludes that the frequency of cancer in general appears to increase with advancing years and this applies to cancer of the male breast.

The etiology of cancer of the male breast is surrounded by the same obscurity as that of all the viscera. The same so-called factors invoked in the case of the female breast have been put forward in the case of the male, but perhaps their value may be greater than in the female because the male mammary gland is not exposed to acute or chronic mastitis resulting from lactation, which certainly are unquestionable predisposing influences for malignant disease of the gland.

Out of a total of one hundred cases of cancer of the male breast only three patients gave a history of heredity, but Poirier, who collected them, admits that often the antecedents of the patients were incomplete. In Laforgue's patient the evidence of heredity was unquestioned, while Pigot relates the case of a patient whose sister died of cancer and in another two cousins died, one from cancer of the breast, the other from rectal cancer. But I am prepared to profess that, all things considered, little importance is to be attributed to the so-called heredity of cancer, yet many competent clinicians regard it as a possible etiological factor, although they do not offer sufficient positive evidence in its support.

Certain cases of gynæcomasty, accompanied by cancer, have inspired some observers with a theory which is not devoid of interest.

The greater development of the female mammary gland being considered as the great etiological factor of all affections of this gland and of neoplastic formations on account of them, it is quite natural to suppose that gynæcomasts should be predisposed to these morbid processes. In reality, there have been some cases recorded whose authenticity is unquestionable, which supports such a view. But histological examination of the specimens has lessened their value in this respect because they showed that gynæcomastic breasts are merely composed of fat and consequently give rise to lipomata rather than to cancer, having epithelium or connective tissue as a starting-point.

The only other etiologic factor to my mind worth discussing is trauma, which is really of remarkable frequency in the antecedents of these patients, and I am firmly convinced that it is probably the foremost factor in the production of malignant growths, not only of the mammary gland but in all other viscera. Because you must not forget that a trauma may act as a stimulant to the cells of a preëxisting tumor and unknown to the patient. It has also been questioned whether the trauma ascribed gave rise to a particular histologic type of new growth. I draw your attention to this disturbing fact that I have found that sarcomata were the most common of the malignant growths in the male breast, after which comes carcinoma. Now, Geinatz studied 1906 cases of all kinds of neoplasms and found that in 20 per cent. of sarcomata there was a history of traumatic violence. Deihmann statistics give 231 cases of sarcoma, 13 per cent. of which had traumatism as a starting point. It seems to me conclusive that acute trauma is rather often the causative factor of sarcoma, a point, by the way, which is of practical importance from the viewpoint of responsibility in cases of legal compensation. On the other hand, no man of experience will deny the part played by repeated irritation in the development of certain epithelial growths, as, for example, smoker's cancer and that developing on syphilitic lesions, varicose ulcers and X-ray burns. In some cases of cancer in the male breast both zona and eczema has been found in the patient's antecedents and I can see no good reason why these cutaneous lesions may not act as irritative lesions which had an influence upon the development of the neoplasm.

Cancer of the male breast offers characters in common with the same morbid process in the female. It is generally present in the

form of an indefinitely limited tumor, adherent to the rest of the gland, invades the surrounding structures, infects the lymph-nodes, recurs after removal and becomes generalized. However, it is possible, now that malignant disease of the male breast has been given more study, to describe a clinical physiognomy belonging to it.

The onset seems to be somewhat the same in all the reported cases, and it is usually by chance that a little indolent tumor in the breast has been discovered. In only one case that I know of did the patient first notice an ulceration, in the form of what seemed to be merely a cutaneous abrasion on the external margin of the nipple a few days after the growth had been discovered. But it is more than likely that the neoplastic nodule had been present long before it came to the patient's notice.

Since I said that it was by chance that the patient discovers the tumor, this means that—like all cancerous growth of the breast—they are painless at the start. Pain only comes on at a late period of the process, usually in the form of a pricking sensation at first, which does not trouble the patient much, if any. But I know of one example in which the pain was so severe at the onset of the growth that it decided the surgeon to operate. This, of course, is extremely rare. Quite often there is a serous discharge from the nipple as the first symptom, after which it may become sero-purulent, bloody or even distinctly hemorrhagic; but it is probable that this rusty-colored secretion is often absent in neoplasms developing eccentrically in the gland and is met with more particularly in intracanalicular growths.

The size of the tumor is essentially variable, from that of a pea to an orange, but one fact is certain and that is that as a general rule cancer of the male breast never develops to the same extent as in the female. When seen early in the process, the tumor will be found hard, elastic, irregular and bosselated and can be made to move over the underlying fascia. There are some enlarged cutaneous veins and the skin becomes infiltrated by the neoplastic elements *much sooner* than in the female. The reason for this is probably because of the small amount of connective tissue interposed between the gland and the skin. The ulceration thus formed is surrounded by bleeding raspberry-like granulation tissue.

At a more advanced phase it is not uncommon to find numerous cancerous nodules scattered throughout the skin of the mammary

region. At the same time the growth becomes adherent to the underlying structures and to put this in evidence you have only to ask the patient to bring the arm against the trunk while you hold the elbow, thus counteracting his muscular effort, the pectoralis major becoming contracted. While the growth is thus immobilized when you try to seize it with the hand, it shows that it has contracted adhesions with the deep muscular layer of the thorax.

Retraction of the nipple is not uncommon and is due to fibrous tracts emanating from the neoplasm; it is above all present in the slow-growing neoplasms in which connective tissue predominates. Involvement of the lymph-nodes is frequent, and out of a total of 158 cases of malignant disease of the male breast which I have collected, it is mentioned in fifty-one, or nearly 33 per cent. Now, whether or not it is the difference existing between the lymphatic system in the male and that in the female, of one thing I am quite sure, and that is lymphatic metastasis never attains the same extent in the male as in women. The enlarged lymph-nodes are preferably found under the lower margin of the pectoralis major and at the bottom of the axilla; they are small, hard, movable and occasionally are connected with the growth by a cord-like process represented by indurated lymphatic vessels. Only exceptionally will you come across any large ones.

The metastasis commences at an early date in the process, and, although clinically the lymph-nodes seem to be free, microscopically they show an infiltration of cancer cells. In advanced cases the subclavicular lymph-nodes will be found enlarged if careful search be made, but it is not always clinically possible to detect them.

The patient's general health remains longer intact than in the female and this may probably be accounted for from the slow evolution of the scirrhus, which is the type of cancer most common in the male breast and also because of the lesser blood-supply, so that the introduction of the toxic products of the growth are not thrown into the circulation so quickly.

The evolution of the neoplasm may be very slow, so that the patient may not consult the physician for several years after the onset of the process. But this is not always the case and sometimes the nodule which has remained stationary for several years may suddenly begin to grow at a considerable rate. This sudden increase met with clinically corresponds perfectly with pathological data, for we know that it

coincides with the epithelial diffusion in the connective tissue septums or at the appearance of cysts surrounding the tumor, usually in the case of sarcoma, elements which are very different from the viewpoint of the prognosis.

Although the final outcome is more distant than in women, it is none the less fatal. Besides visceral or general metastases, the absorption of the toxic products secreted by the tumor cells finally result in cancerous cachexia which carries off the patient.

As in the case of all malignant processes, the interest of a very early diagnosis is of the highest importance, so that an early surgical interference—which is the only life-saving measure at our disposal—can be undertaken as near the onset of the affection as possible. In practice, however, this diagnosis, which might have been an easy matter at the onset of the growth, is only made at a rather advanced period in the evolution of the neoplasia, because the mildness of the functional symptoms do not lead the patient to consult a physician. Williams has shown that the average time of the case coming under medical observation is not before the thirtieth month and some have run along for seven or eight years. In these circumstances surgical interference offers little chance of putting a stop to the evolution of the malignant process.

I will rapidly direct your attention to the principal thoracic affections which, in the male, may lead to confusion with cancer of the breast and at the same time I will indicate the essential clinical elements which shall lead you to make the diagnosis of malignant disease. At the very early phase, before the neoplasm has undergone an ulcerative process, it may be mistaken for a tuberculous abscess of the ribs, but if the starting-point in the bone is made out, the torpid evolution considered an error in diagnosis seems to me well-nigh impossible. These abscesses often assume an elongated shape following the direction of the ribs to which they adhere. When the tumor softens and an abscess has formed more or less distinct fluctuation can be made out at the centre of the tumor whose indurated margin forms the circumference. An exploratory puncture will remove all doubt as to the nature of the affection.

Mastitis of puberty gives rise to a slight tumefaction of the breast, with pain, a bosselated condition of the gland and a serous discharge from the nipple; but the evolution is acute or subacute and resolution

soon takes place. Hydatid cysts of the mammary gland are very uncommon, while examination of the fluid withdrawn by puncture reveals the scolex and daughter vesicles. You may also resort to the search for eosinophilia and Weinberg's and Parvu's reactions. Galactocele and dermoid cysts are rare in women and still more so in men, since I know of no authentic instance of either.

Non-ulcerated syphilitic gummata of the breast have an onset not unlike that of cancer, but the diagnosis need not long be doubtful if a Wassermann be made, although should it prove negative it does not rule out syphilis and when it is positive it does not necessarily mean that the tumor is syphilitic. When in doubt, start the patient on specific treatment which is the old reliable touchstone for diagnosis in these circumstances.

Non-malignant mammary growth, such as fibroma and adrenoma are less common in men than malignant growths. They develop before the age of forty and have a common character with cancer, namely, the discharge of a pinkish discharge from the nipple. Some clinical signs, such as the small size of the tumor, its mobility and slow evolution speak in favor of a non-malignant process, but no one of these signs can be said to be pathognomonic. As they may undergo malignant transformation at some time, you will always be on the safe side to advise their removal.

Tuberculoma of the breast is a small, indistinctly limited tumor, indolent, whose onset will probably date back three or four months when you first see the case; there is sometimes retraction of the nipple and in 75 per cent. of the cases there is involvement of the axillary lymph-nodes. Should this have *preceded* the appearance of the tumor the diagnosis of tuberculosis *is almost a certainty,* but if the axillary adenopathy and mammary tumor develop at the same time or if the latter appears first, there is much diagnostic uncertainty so long as the tubercuIous foci do not soften and break down.

In favor of the diagnosis of tuberculosis you will make the following considerations: Mammary tuberculosis is very rare indeed in the male and there is a disproportion between the size of the tumor and the extent of the axillary lymphatic involvement. In cancer the lymph-nodes are small, hard, movable and separated from each other. In tuberculosis the entire axilla is boggy from the periadenitis, while softening and suppuration occur early.

Although so far as I know, cystic disease of the mammary gland has not been met with in the male, one or two examples of cancer surrounded by secondary hard, round deposits, recalling the syndrome of Reclus' disease have been reported, and in the circumstances might lead to some doubt in the diagnosis. But the extreme slowness of the evolution of cystic disease and exploratory puncture in particular will settle the question.

When a cancer has reached the phase of ulceration it might be at first mistaken for a syphilitic chancre of the nipple with a secondary infection of the sore, and here Wassermann's reaction is of value as a positive result will be obtained if the lesion is three or four weeks old. Ulcerated luetic gummata are round, deep-seated, painless, sanious and without marked adrenopathy. Ulcerating tuberculous lesions have irregular undermined margins; they are broader than they are deep and sometimes present islets of skin on their surface which become destroyed later on. The adenopathy is more diffuse than in cancer.

What makes the difficulty of diagnosis of cancer of the male breast is its extreme rarity, and whenever you have any hesitation it is far better and safer practice to remove the growth without awaiting for events, as delay may mean disaster. In an ulcerated growth a biopsy may be made and the tissue removed examined microscopically, while if pathologic examination of the tumor removed shows that it is malignant, a second complete operation, just as is done in the female, can be at once undertaken.

V. OSTEOMA OF THE ORBIT

A few days ago some of you were present when I removed an osteoma of the orbit. The operative procedure in these cases will vary so that I cannot give you any rules as to the technic to be selected, as it will depend entirely upon the anatomic situation and relations of the tumor. Total excision of the tumor must be done or else let it alone and you may regard the mortality of these operations as about 10 per cent., *provided that the brain and the meninges have not undergone any serious pathologic change.*

Osteomata of the orbit are bony growths which reproduce all the varieties of bone tissue, taking their origin in the walls of the orbit itself or in the neighboring cavities, such as the ethmoidal cells, nasal

fossæ, antrum of Highmore and, more frequently of all, the frontal sinus. It is only after they have developed considerably that osteomata of the frontal sinus project into the orbit. In reality, no matter where they originate they increase on all directions at the same time, so that they are not always confined to a single region, as I shall endeavor to show you.

Most of these growths are rounded into shape, usually elongated, like an ovoid, or occasionally in the form of a segment of a sphere, with an even, smooth or mammillate surface. Occasionally, however, the bony growths assume very irregular shapes; thus Arcel mentions an instance in which the neoplasia which looked like the cup of an acorn lodged in the displaced eye.

The size of these osteomata varies between that of a filbert to a hen's egg and rarely have they developed to the volume of an orange, but in one case Mackenzie was able to introduce his fist into the space occupied by the growth after it had been removed and the eye-ball enucleated. Tentor has also recorded a case where the osteoma had attained the size of a child's head and two other instances are referred to by Berlin—one due to Hilton, the other to Michon—in which the tumor measured seven and a half inches in circumference and two and three-quarters in thickness. The heaviest orbital osteoma that I am aware of weighed five hundred grammes or a little over one pound.

The neoplasias under consideration have little, if any, tendency to generalization. The lesion is usually unilateral and *solitary*. Nevertheless, these growths have been met with on both sides and, strange to say, symmetrically placed; exceptionally several may be found in one orbit.

For the most part, fixed in place, they are rarely movable, and out of a total of sixty cases that I know of only one was movable, but in this case it is to be remarked that they were osteophytes of the roof of the orbit, which the patient could voluntarily cause to move by blowing his nose. In general, osteomata of the orbit possess a rather large base of implantation; occasionally they are pedunculated with a very fine point of attachment, and in some exceptional instances they have been found completely free within a kind of mystic cavity which isolated them from the surrounding structures. The latter condition has been more often seen in osteoma of the frontal sinus.

As to the site of these neoplasias I would say that this is a moot

question. Thus, some maintain that they are more common in the upper jaw and arch of the eyebrow. Others suppose that they are more frequent in the internal and lower aspects of the orbit; Poland regards them as being quite as frequent within as without, while Fleys considers the upper wall as their site of election. Many are of the opinion that they develop with equal frequency in any part of the orbit and MacKenzie, who also was of this opinion, said that they were on the whole more common on the base of the orbit in that portion which corresponds with the superior maxillary bone.

Little by little, however, the topography of osteomata of the orbit has become more precise of recent years, and it has been shown conclusively, I think, that the point of election of these neoplasms is especially the upper and internal walls of the orbit, which are relatively the most exposed, although there is no part of the orbit where they have not been found. For example, out of a total of forty-nine cases, thirty-one times the growth arose above, or 63 per cent.—twenty-five being above, five above and inwardly and one above and outwardly—ten times the tumor grew from within, or 20 per cent.; six times below or below inwardly, or 12 per cent., while only one case developed outwardly, the growth starting from the shell of the temporal bone and penetrated the orbit, while in one other case the neoplasm surrounded the entire orbit like a ring.

In yet another, statistics compiled by Tchilinghisoff, the results are different from the above figures. Out of a total of fifty-five cases, in which the seat of the growth was distinctly described, there were twenty-one cases in which the neoplasm developed at the supero-internal angle of the orbit, mostly originating in the frontal sinus. However, an osteoma developing at this point need not necessarily come from this sinus. Thus, in Tchilinghisoff's personal case the tumor developed at the point of union of the os planum and the frontal. Seventeen times the osteoma was situated directly within and was adherent to the ethmoid or the unguis; thirteen times the neoplasm started from the orbital vault; twice only it came from the maxillary sinus and perforated the floor of the orbit; in a single instance the tumor was seated at the external angle of the orbital margin. In one other case it started from the base of the skull and after having destroyed the apex of the orbital funnel it became spread out in the cavity of the orbit. It, therefore, results that, in order of frequency, the supero-

internal angle of the orbital border is the most common site for these growths: 40 per cent.; second in frequency comes the internal orbital wall: 30 per cent. to 31 per cent.; thirdly, the roof of the orbit: 23 per cent. to 24 per cent.; fourthly, the floor of the orbit: 10 per cent.; and, last of all, the external orbital wall: 0.50 per cent. It is unquestionable that the frontal and ethmoid are the bones from which osteoma is more prone to arise when the orbit is involved, because their greatest frequency is found to be at the internal angle and, above all, the supero-internal angle of the orbital margin.

Generally speaking, osteomata of the orbit undergoes a very slow evolution, especially the eburneous variety. Their development is usually counted by years and in thirty-seven cases in Tchilinghisoff's statistics, where the apparent time of onset is exactly mentioned, it dated back from one to five years in twenty-seven, from five to ten years in seven, and in two cases it was from ten to twenty years, and in one case it was over twenty years.

I would point out to you that this slow development is, to a certain extent, subordinated by the structure of the neoplasm. Thus, spongy and compact osteomata appear to grow much more quickly than the eburneous type of growth, because, among the large specimens, they were usually spongy osteomata with a compact shell with a spongy content, while the ivory-like form is in the early stages relatively small and requires much more time to attain such large proportions. Cases of exostosis, of course, are known where the tumor had been developing for fifteen or twenty years before the patient found it necessary to seek medical advice, and I even know of one where it had been present for forty-two years.

Osteomata of the orbit are in themselves indolent, and they are rarely painful when pressed upon. However, they very often give rise to spontaneous pain, due either to compression or distension of the surrounding structures or when there is a syphilitic origin of the tumor, but the latter fact is very rare indeed, because syphilitic osteomata of the orbit are likewise a very rare morbid process. In sixty cases of osteoma of the orbit pain was present in sixteen, or 27 per cent. The pain is very variable: heavy, light, or severe, continued or intermittent; sometimes it assumes the neuralgic type and involves the half of the head on the side of the tumor. It is always transmitted along the fifth cranial pair and is perceived at times in the globe of

the eye, sometimes deep in the orbit, in still others it extends towards the nose, the temple or around the margin of the orbit.

In most instances, the pain is the consequence of compression exercised by the neoplasm on the various sensitive nerves, as the nasal, frontal, the supra- and infra-orbital, which become surrounded by the two bosses formed by the growth or between the neoplasm and the orbit. But they may also be due to compression of the eyeball or to the secondary inflammatory participation of the peribulbar tissues and organs and the bony walls; or else complications arising in the cornea and afterwards the iris, choroid, ciliary body, etc.

It is interesting to note that sometimes the cause of the pain cannot be explained. For example, it is not very comprehensible why a small osteoma in some subjects gives rise to very great suffering, oftentimes intolerable, while other patients suffer little, even when the neoplasm is very large. Perhaps in these cases to explain the painful phenomena, consideration should be given—leaving aside the sensibility inherent in the patient—to the seat of the neoplasm which may be in more or less close proximity to the nerve branches of the ophthalmic.

The chronic progress of orbital osteomata makes the process a silent one at the onset, only giving rise to very obscure manifestations, and it is only at a later date that the symptomatic picture progressively unspreads itself. It, therefore, follows that the first alarming signs almost always appear several years after, and since in most cases the development continues without at first giving rise to pain of any kind, so that you readily see why these patients will not consult you usually until some time has elapsed since the growth began.

Exophthalmos is beyond question the most constant sign of osteoma of the orbit. It is, for that matter, the symptom common to all neoplasms of the orbit, unless it be the consequence of a collection of blood. The dislocation of the globe takes place very slowly, requiring months, or more likely years. The degree of the propulsion will vary with the size of the neoplasm, but it is important for you to remember that the slightest projection with the cavity of the orbit will result in an apparent exophthalmos. You know that the globe of the eye gives way very readily to neoplasms arising in the cavity of the orbit. At the onset the exophthalmos consists merely in a slight propulsion of the eye, but little by little, as the growth increases, the dislocation

becomes more and more considerable and thus the lateral deviation may even reach compression.

The direction of the displacement of the eye necessarily varies with both the site and direction of the development of the bony growth. The eye is usually pushed forward and at the same time towards the nose or the temple, up or down, according to the point in the orbit from which the neoplasm arises or enters the orbital cavity. I only know of a single instance of compressing the eye backwards. The tumor started from the upper border of the orbit. Since these growths develop more frequently at the internal angle, and especially the supero-internal angle of the margin, the consequence is that most always the displacement will be outward and particularly outward and downward.

Theoretically, when the deviation of the globe becomes considerable, you might be led to suppose that it should be frequently, or even almost invariably, accompanied by diplopia, since the divergence of the two visual axes is often very great. But such is not the case, because clinical data show that the contrary is true, and it only occurred in seven out of a total of sixty cases, which gives a proportion of about 12 per cent. This infrequency of diplopia may perhaps be explained by various retinal disturbances, the consequence of optic nerve compression which deteriorates the function of vision before diplopia has had time to manifest itself or perhaps from the habit that these patients contract at the onset of the trouble of making abstraction of false image and consequently do not see double.

The exophthalmos is usually accompanied by a diminution of, or total loss of, the movements of the eye. The degree of this limited motion is usually in direct relation with size of the tumor and for this reason with the degree of propulsion of the globe. Almost always partial, the abolition of movement is usually on the side of the tumor. Sometimes it has a purely mechanical origin, brought about by the tumor itself. In others, its origin may be called functional, because it is then the consequence of paralysis of some motor nerve of the four straight and the two oblique muscles, resulting from compression by the bony process.

The point of election for the decrease of movement varies with starting-point of the growth, as well as the direction of its development. Since the side of predilection is the internal angle and especially

the supero-internal angle of the orbit, it must necessarily follow that in most cases the inward movement and especially inward and upward motion are the most particularly involved. Complete abolition of movement is very rarely observed and occurs only when the neoplasm assumes unheard-of dimensions or is out of all proportion to the size of the orbital cavity in which it becomes lodged. In one case where it did occur a radical operation was followed by complete restoration of the movements and was a brilliant success.

A visual disturbance is often related to the exophthalmos and limited motion of the globe, which consists of absence of the central vision, scotoma, narrowing of the visual field and amblyopia.

Lateral compression on the bulb from the neoplasm may elongate or shorten its antero-posterior axis and thus give rise to hypermetropia or myopia, as the case may be. Usually, the objective vision will not be due to a disturbance of refraction, but is rather of retinal origin, so that it is to the optic nerve that your attention should be directed. Now, in fact, the displacement of the eye is necessarily accompanied by traction on the nerve, which, combined with the pressure exercised by the growth, brings about changes in the fundus oculi, usually phenomena of stasis: a more or less marked coloring of the papilla, due to engorgement of the veins; arterial anæmia or even ischæmia resulting from compression of the return circulation.

Thus can be explained why œdema may frequently give place to neuritis and then to papillary atrophy, finally ending in complete abolition of the functions of the retina. In one case abolition of the sight coincided with a dilatation of the pupil, an evident proof that the damage done by compression sometimes acts on the ciliary nerves and produces paralysis of the ciliary muscle as a consequence. In another case there was an optic neuritis manifestly the consequence of compression by the tumor as was proved by the amelioration which followed excision.

It should be remarked that the removal of the mechanical obstacle, that is to say the tumor, will sometimes result in considerable improvement, not to say a complete return of the vision. This latter fact was long since brought into relief by Bowman, who once saw, before operation, a papilla so red and tumefied that only the emergent vessels allowed it to be distinguished from the rest of the fundus oculi. Two months later these changes had retrogressed and the vision had re-

turned. Given such clinical data, it seems logical to admit that the visual disturbances are often the consequence of rather mild circulatory disturbances and not to irremediable anatomic changes.

I shall now add some remarks relative to some symptomatologic peculiarities of osteomata developing in the surrounding sinuses before they make their way into the cavity of the orbit; in other words, while they are still confined to the various sinuses, ethmoidal cells, nasal fossæ, or the skull. I shall not detain you long with their symptomatology, because while they are still outside of the orbit their evolution usually takes place without entailing any very appreciable manifestations. Later on, when they have destroyed the walls of the orbit and project within its cavity, then their symptomatic picture becomes mingled with that of osteomata arising in the orbital walls and, at a given moment, there is really no way you can distinguish between them, and it is only at operation that the true situation of affairs will be brought to light.

The bony walls of the frontal sinus do not, any more than the other parts of the skeleton, escape from these morbid osseous productions. I have already told you that of all the periorbital cavities, the frontal sinus was the one most inclined to give rise to osteomata. At the onset, the patient experiences absolutely nothing in the way of painful phenomena unless compression of the nerve filaments in the territory of the nasal, frontal or supra-orbitary should take place. It is only after the lapse of some time that he may experience a sensation of weight over the root of the nose, due to the size and weight of the neoplasia. Should the tumor take on considerable development, it may compress the sensitive nerve fibers and thus be the cause of more or less severe pain or even intense and continued neuralgia.

These neoplasms are more apt to develop on the lower wall of the frontal sinus and by the pressure they exercise they provoke a partial absorption—pressure atrophy—of the bony surfaces, a loss of substance results and the tumor makes its exit from the sinus; it then progresses either towards the cavity of the orbit or the interior of the skull, according to the direction it shall ulteriorly follow and gives rise to the various symptoms and complications of which I shall speak in a minute.

As to the antrum of Highmore, you know that its anterior and lower walls are much more resisting than the upper and the internal

ones. Following dilatation of the antrum by the osteoma and by pressure atrophy the superior wall, which forms the floor of the orbit, can be easily displaced or perforated. It will then give exit to the tumor which, starting from the maxillary sinus, will finally project into the cavity of the orbit and from this time on will assume the characters of an orbital growth. At the onset, an osteoma of Highmore's antrum, the symptoms to which it gives rise will remain obscure for a long time, but it may also reveal its presence by causing a more or less considerable deformity of the cheek by displacing the external nasal wall towards the septum and by deviation of the lacrymal track with a consequent epiphora. Occasionally, phenomena of compression may be observed or from traction on some nerve filaments, producing neuralgic pain in the domain of the infra-orbital nerve.

Osteomata developing in the nasal fossæ may also destroy and perforate the unguis and ethmoid and afterwards project into the orbit. This expansion takes long to occur and only when the growth has reached a considerable size. But so long as the osteoma is extra-orbital, there are evidences of narrowing or complete occlusion of one of the nostrils, in the form of respiratory difficulties. The septum may be forced to one side, the nose deformed, and the sense of smell perverted, diminished or abolished on one side.

To these symptoms others resulting from pressure on the nasal fossæ and lacrymal sac are present in the form of lacrymation. Finally, rhinoscopic examination will, in most instances, allow you to see the growth directly. The neoplasm may sometimes completely fill the nostril, and for this reason it can be seen without resorting to artificial lighting.

As to osteomata of the cranial cavity which ultimately reach the cavity of the orbit their starting point will be the base of the skull; that is to say, at the point nearest to the apex of the orbital funnel. As in other cases of osteoma developing in the sinuses or orbit, their evolution is slow but their development is often accompanied by cerebral disturbances of a more or less serious nature, the consequence of pressure on the cerebral cortex.

I shall purposely leave aside the subject of osteoma of the ethmoidal sinus as well as that of the sphenoidal sinus, because so long as these growths do not involve the orbit they are absolutely silent

symptomatologically and give rise to no clinical signs which differentiate them from small orbital osteomata growing in this region.

Let me now briefly refer to the various complications which can crop up during the evolution of these morbid bone productions. In fact, in other regions of the human body, osteomata do not usually offer any very serious disturbances, but the same is not true in the case of the orbit which, when they take on a considerable development, result in deformities and perforation of a more or less serious kind, according to their anatomic relationship with the neighboring structures. Thus, osteoma of the internal orbital wall may encroach upon the nasal fossæ and occupy both the nasal and orbital cavities at one and the same time, while the external growths may extend to the temporal and zygomatic fossæ. Those developing from the lower orbital wall often get into Highmore's antrum; those of the upper wall encroach upon the frontal sinus or if the growth starts from this cavity they perforate the walls and project either into the orbit or into the skull. The deep-seated osteomata of the orbit pass through the posterior orbital apertures, enter the cranial cavity, or, if they start from the base of the skull, they follow the same route and break into the cavity of the orbit. All these orbital osteomata may develop in a forward direction and project beyond the orbital margin or even attain the opposite orbit.

You see that all these complications depend solely upon the size of the neoplasm and the direction it takes in its development and are exclusively due to pressure upon the surrounding anatomic structures. Whether originating in a sinus or the orbit itself, the pressure exercised by the growth on the walls in the long run produce pressure atrophy and perforation of the bone laminæ. If the perforation takes place in the nose, the frontal or maxillary sinus, the temporal or zygomatic fossa, the neoplasm will project at this point. You will readily conceive how serious this complication may become when the perforation takes place in the roof of the orbital cavity.

I have already told you that the frontal sinus may also be perforated on its cranial aspect from pressure atrophy and this loss of bone tissue establishes a direct communication between the sinus and the cavity of the skull. The same thing can happen in cases of orbital osteoma when the growth originates in the skull. Therefore, in all

these cases you should fear, not only the complications resulting from cerebral compression, but also meningitis and suppurating encephalitis, which will certainly complicate the prognosis from the viewpoint of surgical interference.

It is perfectly true that these growths develop very slowly and that the brain will easily support the compression to a certain extent. This fact probably explains the great infrequency of cerebral manifestations, because very few of these patients die from these consequences. But should an inflammatory process arise the accidents will not be long in developing and jeopardize the life of the patient.

I must also mention secondary inflammatory processes which occasionally supervene when the osteoma has attained considerable size. The eye may be greatly dislocated or even pushed out of the orbit. You will naturally conceive the horrible condition which results and the danger to the eye. The upper eyelid is tense and retracted upwards so that it cannot protect the globe, so that the latter is exposed to all kinds of infective processes. Inflammation ensues, a dry keratitis develops, ulceration takes place and then necrosis when perforation of the globe will occur.

If suppurating complications of the peribulbar structures occurs, persistent sinuses may develop, complicated by ectropion, purulent catarrh of the lacrymal sac and suppuration of the bulbar and palpebral conjunction. The injection may travel to the nasal fossæ or into one of the sinuses, and it may happen that, after necrosis of the neighboring parts, the osteoma becomes movable and is pushed outwards through the track formed by a sinus.

The distension and disjunction of the bony structures containing the neoplasm may sometimes take on an unheard of disproportion. It is in these circumstances that you will sometimes encounter ptosis of the upper lid, especially when the pressure acts on the roof of the orbit and compresses the levator nerve of the lid. This phenomenon is very uncommon.

To conclude with the subject under discussion, I would say that from the pressure that they produce on the peribulbar venous plexus, an osteoma may give rise to orbital or conjunctival vascular engorgement, with more or less considerable œdema of the lids, imparting a violet color to them and dilatation of the subcutaneous vessels.

VI. GONORRHŒAL MYOSITIS AND MYOPATHY

If there is any morbid process which you are absolutely sure to meet with in your practice, it is unquestionably gonorrhœa in both sexes. The treatment of gonorrhœal infection, as well as most of its complications, has now reached a point at which the disease may, in most cases, be radically cured if the patient will follow skilled advice. There is, however, one complication of clap to which I would call your attention and that is myopathy and myositis.

Several weeks after the onset of a gonorrhœal urethral infection, and especially in the male, or following the return of subacute manifestations of an incompletely cured gonorrhœa, even when the discharge seems to be decreasing, the patient will complain of very sharp pain, which shoots along the nerve tracks of the region. This involvement of the muscular system by gonorrhœa takes place usually during the third week, at the beginning or end, sometimes at the commencement of the fourth. It is possible to meet with it sooner than the third week, although this is uncommon.

One of two conditions will then be offered you. Usually the infection is not particularly marked. The patient will tell you that he suffers severely and continuously in a region that he will not clearly define. In the area indicated it will be impossible to detect anything by mere inspection—there is no redness, swelling or œdema. When all is said, this complication of gonorrhœa is passed over rather too lightly by the physician who does not attribute any importance to the symptoms complained of and which would not have been remarked had it not been for the patient.

But now let us palpate the patient. The touch is felt more keenly at the area complained of than over the surrounding surface. In some patients, even a mild pressure will cause the patient to cry out. At the same time, you will feel the underlying muscle is harder than in the normal state and contracts very suddenly, although in some cases it may have retained its normal consistency. The contracture is sometimes spontaneous or may even occur by slightly stroking the skin over it, so that the patient will assume various attitudes in order to avoid its occurrence.

The patient's general health will usually be good, but when there are any phenomena of a general nature they usually appear before

the symptoms in the muscles. In the form of gonorrhœal myopathy under consideration these may be an elevation of the temperature, perhaps even high, although this must be regarded as exceptional.

Changes in the general health are more marked in the serious forms of gonorrhœal muscular involvement, namely myositis, which at the onset simulates a myalgia from the nature of the pain and its apparent mildness, although it differs from it in the greater intensity of the pain and the presence of a tumor offering special characters. However, it may be, in some very marked cases of the morbid process, the changes in the general health never are observed with the same intensity as those arising in other forms of infectious myositis, and this is precisely a very important sign from the viewpoint of differential diagnosis.

In gonorrhœal myositis, the temperature rises a little in the evening. It reaches 101° to 102° F., and upon only one or two occasions have I seen it attain 104° F., which is very exceptional indeed. The pulse becomes rapid, one hundred to one hundred and ten beats per minute; there is headache, anorexia and a rather marked state of indigestion with a furred tongue and other signs. Constipation, sometimes diarrhœa, is observed. Once or twice rose spots have been noted, similar to those of typhoid fever; therefore, there is offered a possible chance for making a diagnostic error. I have known insomnia to be a troublesome feature in these cases, and it may be very obstinate to treatment, but it subsides when the muscular process retrogresses.

The local manifestations are very characteristic. The pain is the first to appear. It is very sharp, continued and spontaneous and is considerably increased by palpation or manipulation of the parts involved. The acuity is such that the patient in his endeavors to immobilize the already contractured muscles, assumes the most striking attitudes. Sometimes he inclines his head as in torticolis; at others he flexes the limbs one over the other; sometimes he will remain perfectly stiff. The position assumed has always for object to put at rest the muscle or group of muscles involved.

It is at the time that the pain has reached its maximum that the tumor appears. It is hard, painful, but not fluctuating and will be found to blend off insensibly into the muscle upon which it reposes. This muscle is itself harder than its fellow on the opposite side on

account of the always constant contracture. The small tumor is perfectly free and movable under the skin and over the underlying parts. The skin over the site of the muscular tumefaction remains practically normal. There is no inflammation or œdema; at the most there may be a distension of the subcutaneous vascular system and even this is not constant.

Involvement of the lymph-nodes is absent in a large number of cases, but their tumefaction may even take the form of an acute adenitis with a diffuse infiltration of the surrounding tissues and considerable pain, phenomena which for that matter subside with the muscular lesions. You must never forget that a gonorrhœal myositis often goes hand in hand with other gonorrhœal complications, especially with synovitis, hydrarthrosis and myocarditis. The latter fact is important.

The muscular complications of gonorrhœa appear in general to be very benignant. The other types of infectious myositides almost always end in suppuration, or in the milder cases in various degenerative processes or atrophy. The general symptoms have been known to be so severe and acute as to cause death. Nothing like this occurs in the gonorrhœal form. General disturbances occur at the onset, it is true, but they are usually very moderate. Then the more or less intense pain supervenes.

In many cases the process ceases at this phase and the painful phenomena progressively disappear, either spontaneously or by a well-directed treatment. The myalgic complication retrogresses in a few days without leaving any trace, while in gonorrhœal myositis the process, instead of retrogressing, undergoes an aggravation. The muscle becomes indurated and then a tumor appears. But these are only fleeting phenomena and in ten or twelve days in the average case the morbid process enters upon a retrogressive phase.

As in myalgia, the pain is the first symptom to disappear, and it is its decrease which marks the beginning of the phase of resolution. The sleep returns with the diminution of the pain and next the myalgia subsides. Only a small indurated nodule remains for some time after and at length disappears without causing atrophy of the muscle. The prognosis is, therefore, good since the process never goes on to suppuration, there is no atrophy and resolution takes place always *ad integrum*.

Although the diagnosis may be sometimes a question of some difficulty, the same does not apply to the treatment, which is very simple. To begin with, massage must never be employed—it increases the pain. Application of camphor liniment or salicylate of methyl have never given me any results. Tincture of iodine applied over the painful area may give relief, but it generally fails. Salicylate of sodium, potassium iodide, antipyrine taken internally, have no particular action on the process, so that they may as well be discarded. Injections of morphine may relieve the pain, but I would advise you not to pin your faith too much upon it.

Damp heat is what will give you the best results. Heat and moisture are the two great sedatives of pain. Envelop the entire part in cloths wrung out in hot water at the temperature of about +96° F., cover these with gutta-percha and do up in a roller bandage. This dressing is to be repeated each time that it has cooled off. This is often enough to calm the pain; but if it fails, then you will do well to order local baths of one hour, three or four times a day, at the temperature of +86° to 96° F. In the intervals of the baths the moist hot dressings are kept constantly applied.

It may happen that the region involved is such that it cannot be placed in a local bath, for example, the abdomen, back or neck. In these circumstances order a full bath to be taken every day or every second day. But these long immersions may result in maceration of the epidermis; therefore, when the acute phase has been passed you will, with advantage, paint the parts with the following mixture or ointment,

℞
Ol. gaiacol.
Ol. Amygal. dulc. āā equal parts
S. For external use as directed.

℞
Gaiacol, 5 grammes.
Methyl, salicylat, 20 grammes,
Lanolini, 40 grammes.
M. G. ung.
S. As directed.

This treatment as above outlined will first cause the pain to disappear so that in about a fortnight the process will retrogress to such an extent that further treatment will probably not be necessary.

It goes without saying that the general health must be looked after and that the urethral process or any other complications of gonorrhœa, if any exist, should be dealt with according to our modern conception of the therapeutics of this omnipotent affection.

VII. THE CORRECT OPERATION FOR PARAPHIMOSIS

Another not infrequent complication of gonorrhœa is paraphimosis, although it often occurs when there is no affection of the urethra. There are many means at your disposal for treating this condition, which must be attended to without delay because not only does it cause much suffering, but if left alone sloughing will occur with quite disastrous results.

You should first attempt reduction of the prepuce by taxis. You first carefully knead the parts in order to empty the parts of blood and to reduce the œdema, which is always considerable. If you obtain this result, then reduce the prepuce by gentle taxis, and usually you will succeed. If any adhesions, they will either be ruptured or rendered sufficiently extensible so that they will not oppose reduction.

If, after a couple of attempts bloodless reduction remains unsuccessful, you will be compelled to resort to operation. If the brevity of the frænum is the cause of failure, it should be divided. But the only proper technic for the operative treatment of paraphimosis is, to my mind, the following. It is rapid, painless and possesses the great advantage of obtaining a radical cure without any chance of recurrence. It consists in excising the preputial ring, and, I believe, was first described by Carlier of Lille.

The penis must first of all be carefully disinfected, but tincture of iodine or other irritant disinfectants must never on any account be used, otherwise disaster will follow. A 1:3000 Hg. cyanide solution containing a little sodium biborate will be found satisfactory and unirritating.

Next you make around the root of the penis a series of injections of a 5 per cent. solution of novocaine; three or four cubic centimetres of this solution will be ample for producing a good anæsthesia of the parts, but the region of the frænum will remain sensitive so that a bit of cotton dipped in the solution should be applied directly over it. By making the injections at the root of the penis, you will not increase the amount of œdema in the prepuce.

Then with a small knife a circular incision is made in front of the constricting ring and one centimetre behind the sulcus of the glans penis (see Fig. 1). This incision should *only include the mucosa*. A second incision is next made behind the constricting ring

at a distance which will have to be decided upon according to *the amount of tissue to be excised. Do not be afraid to excise too much skin.* This second incision is not exactly parallel with the first and comes near to it as the under aspect of the penis is approached. Fig. 2 shows the shape of the excised portion and resembles the quarter of an orange with the two ends approximated. The breadth of the excised portion on the back of the penis will ordinarily be about one and a half centimetres.

When these two incisions have been made the skin comprised between them is dissected off with scissors and if any vessels bleed they should be ligated with No. 0 catgut. If adrenalin has been added to your anæsthetic solution—which it *never* should be—you must carefully look for the vessels since they will probably not bleed on account of the vaso-constrictive action of the drug; otherwise a post-operative hemorrhage will occur which, to say the least, is unpleasant.

The wound is then irrigated with hot salt solution and the skin incisions are brought together by fine catgut sutures, using a fine round Mayo needle. A moist dressing is then applied for the first two or three days in order to reduce any œdema which may occur around the sutures. The patient is kept in bed for four or five days and a cure, without deformity, will result.

VIII. THE TECHNIC OF NERVE SUTURE AND ANASTOMOSIS

The war has given you the sad opportunity of seeing a certain number of cases of primary and especially secondary suture of various nerve trunks. As this operative procedure will certainly come up in your civil practice, I would like to briefly describe the various methods of nerve anastomosis and suture at present currently employed. We know that the functional restoration of a given nerve can be obtained by an anastomosis of this nerve with the central end of another, and it is clear that the general laws governing nerve anastomosis are clearly the same as those presiding over simple end-to-end suture of a divided nerve trunk. You may take the following rules to guide you, as they indicate the necessary conditions for the performance of and a successful outcome after the operation.

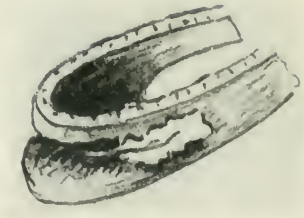
(1) The nerve ends must be sufficiently near together so that their approximation may be obtained without undue tension or too great slackness.

Fig. 1.

Skin incisions.

Operation completed.

Fig. 2



Excised portion of skin.

(2) In general, the suture should only include the perineural sheath and not perforate the nerve when this is possible.

(3) The perineural sheath should be trimmed with fine scissors —such as oculists employ—in order that the axis cylinders project from the sheath; or the end of the nerve may be cut wedge-shape if required.

(4) The suture must be protected by some device—and these are several—from forming adhesions with neighboring nerve trunks, skin, etc. *You must handle the nerve with exceeding prudence and gentleness and never employ anything but blunt instruments.*

(5) Union *per primam* must be obtained; it is the fundamental condition for success.

There are four classic methods for suture which I will describe, the first being *paraneural suture.* Only the connective tissue adjacent to the neurilemma is comprised in the suture, the latter being carefully avoided (see Plate I, A). This would clearly be the ideal suture, because it does not include a single nerve fibre, but it is difficult to carry out and is not apt to be sufficiently solid to assure perfect approximation of the two nerve surfaces.

Perineural suture is done by passing the needle under the surface of the divided nerve and bringing it out laterally, so that it only comprises the perineurial tissues. Theoretically, this excellent procedure is supposed not to penetrate or injure any nerve fibre, but it is only practicable in the case of sufficiently large nerve trunks (see Plate I, B).

The *transneural suture*—already employed by Nélaton—consists in passing the needle transversely through the entire nerve, just above the divided surface and then tying the suture on the side (see Plate I, C). Although this suture guarantees a rather perfect approximation of the two nerve surfaces, it has, perhaps, the disadvantage of being too traumatizing, especially in small nerves if one attempted to pass several sutures in order to be sure of the solidity of contact between the ends of the anastomosis.

The last technic is *mixed suture,* and is the procedure of choice, particularly to be recommended in the case of nerves of small calibre. A transneural suture is first passed and then some sustaining perineural sutures are inserted (see Plate I, D). This suture is relatively mildly traumatizing and in practice it will give you good results.

The only special instruments necessary for nerve suture are small, fine round needles, such as the Mayo pattern, fine scissors and fine forceps with *small blunt teeth* for holding the nerve without injury to it. All the devices for nerve suture used by Spitzy and the special needles invented by Hagedorn and Wolberg are perfectly needless. Always be simple in the choice of instruments for all operations in surgery and you will do better and more elegant work than those who employ special instruments for every operation they undertake.

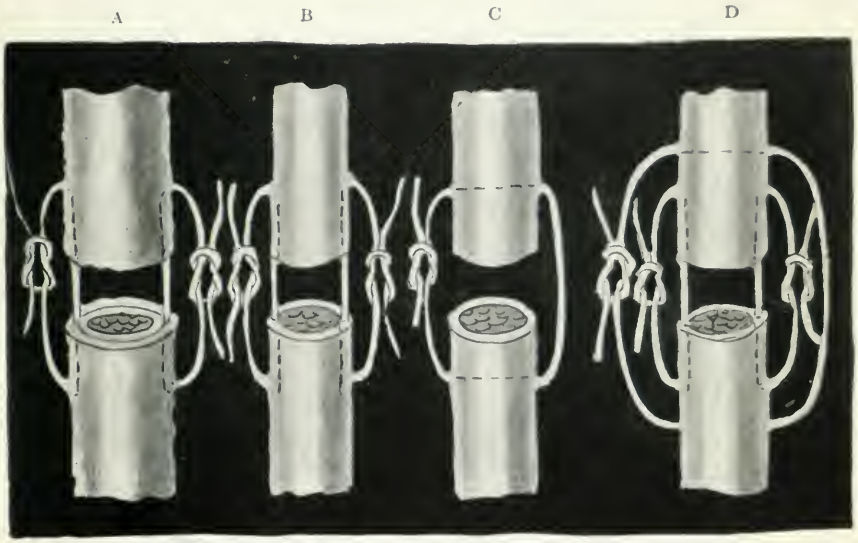
As to suture-material I would particularly recommend ordinary very fine linen thread, Nos. 400 or 500, or Belding Brothers' black silk No. 00000, but I have found the plain linen thread cuts less than the silk. Whatever has been left after the operation must not be used again, as the linen thread will not stand being boiled twice and boiling is the only proper method of sterilizing it. If you choose, you can employ a very fine twenty-day catgut.

As I have already told you, a very important point in the technic is to secure a perfect protection of the anastomosis from invasion by cicatricial connective tissue, which will result from the incision of the structures surrounding the nerve. Now, although the nerves—on account of their perineural sheath are quite resistant to morbid extrinsic changes, to such an extent that a healthy nerve may be bathed in a pool of pus or go through a tumor without damage, such is not the case when the slightest solution of continuity of its enveloping membrane, as it will then be easily invaded, especially by cicatricial tissue. The inevitable result will be that compression from this neoformed tissue occurs or it may cause actual changes in the nerve, which will seriously interfere with its functions or give rise to much distress from pain.

The simplest way to protect the nerve is by covering the anastomosis with muscular, aponeurotic or fat flaps; cargile membrane can likewise be employed. My confrère, the late Professor Girard, of Geneva, used a leaf of goldbeater's skin for this purpose, as it is almost the same as catgut in origin. It is prepared in the same way as catgut. A leaf is passed under the suture nerve and then rolled around it and then held in place by two fine catgut ligatures tied lightly.

Now, as to the technic of nerve anastomosis, and let me say right

PLATE I.



Method of nerve suture.

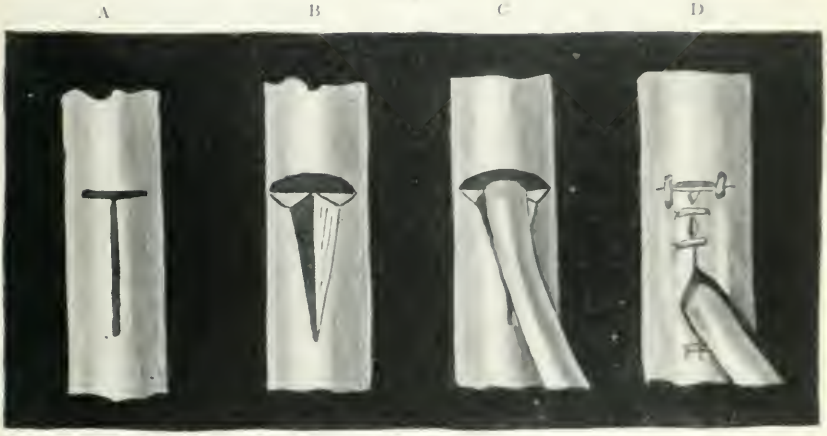
PLATE II.

A B C

D E

Types of nerve anastomosis.

Plate III.



Nerve anastomosis.

here that, in order to avoid all confusion, the term of nerve anastomosis should be reserved for indicating in a general way, *the union of one nerve with another different nerve.* There are three types of nerve anastomosis: (1) *total* anastomosis, (2) *partial* anastomosis and (3) *mixed* anastomosis.

Total anastomosis is the union of the entire central segment of a divided nerve with the entire lower segment of *another* divided nerve (see Plate II, A). It is the product of an end-to-end approximation of two nerves.

Partial anastomosis is performed when only a portion of a nerve is united to a portion of the trunk of another nerve without their complete division. There are two ways of doing this: First, by flaps, when end-to-end approximation is made between two small flaps detached in the direction of the long axis of the nerve (see Plate II, B). Secondly, by implantation, when you suture a flap made in the trunk of a nerve into a transversal slit made in the trunk of another nerve (see Plate II, C).

Mixed anastomosis is obtained by uniting the entire trunk of a divided nerve with only a portion of another nerve whose continuity is not interrupted. There are also two ways of doing this: First, by flaps, when the entire end of a nerve is anastomosed with a flap detached from the continuity of another nerve trunk (see Plate II, D). Secondly, by implantation, when the extremity of a nerve is sutured into a transverse slit made in the trunk of another nerve (see Plate II, E).

It is clear that these anastomoses are of unequal value and that each has its own rather precise indications. If total anastomosis is in some cases—as in facial paralysis, for example—the only rational procedure, it is none the less true that partial and mixed anastomoses have likewise their distinct indications. These anastomoses will be done as depicted in Plate III.

A little *transversal* slit is made in a nerve trunk, including *only a sector* of the nerve and you will then make a *longitudinal dissociation* forming a line perpendicular to the slit and underneath it. The result will be a T-shaped wound in which the end of the other nerve—total or partial—will be embedded. A few fine sutures assure perfect approximation and will place the fibres in direct relation with each other.

I am absolutely opposed to the procedure often resorted to which consists of implanting a nerve in a *longitudinal slit* made in another nerve which, theoretically, it is true, is supposed not to involve any nerve fibres. But such an anastomosis is the result of an ignorance of normal histology. The regretted Dr. Murphy, of Chicago, called this an antiscientific procedure and Girard, of Geneva, was of the same opinion, because if a certain number of nerve fibres are not involved it can give no practical results.

Even the catenating theory exacts that the nervous influx can pass from one nerve to another only when the nerve fibres are in anastomatic contact and that nerve function can only be restored by placing the nerve fasciculi directly in relation with each other. *Nerve tissue will unite with nerve tissue but never with connective tissue.*

PERINEAL PROSTATECTOMY; CHOLECYSTITIS COMPLICATED BY SUBACUTE PERFORATING ULCER OF THE STOMACH

SURGICAL CLINIC.

By HUGH N. MAC KECHNIE, M.D., C.M., F.T.M.C.
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PERINEAL PROSTATECTOMY

Case 4874.—This man, M. L., complains of frequent and difficult urination, with irritable bladder. After urination he is relieved for a short time. He urinates from two to four times at night in fair amount. There is no incontinence; the urine is frequently highly colored and has some sediment. He has general nervousness and irritability; his appetite is good; his bowels are regular; he has no headache, nor backache. He is fifty-three years of age, fairly well nourished, and presents the appearance of a hard-working farmer. His pulse is 60, his temperature is normal, his respiration 17, and his blood-pressure 145 and 90. Renal function is good. A sound passes readily until it reaches the prostate, when it has to be carefully worked through and is firmly gripped. Residual urine is two ounces, with light amber, flocculent precipitates, and ammoniacal in odor; specific gravity 1028; a trace of albumin; sugar negative; acidity 30 degrees; microscopic examination: no casts, squamous epithelium, urates, and calcium oxylates were present; slight amount of pus and a few bacteria.

Cystoscopic examination shows the bladder to be slightly reddened in the trigone, with slight protrusion of the prostate into the bladder.

Rectal examination shows a markedly enlarged prostate, which is smooth, firm and regular in outline.

The diagnosis is hypertrophy of the prostate producing the usual obstruction. There is no evidence of malignancy nor of renal complication.

It appears that the proper procedure for this man is prostatectomy before he gets notably worse, before cystitis develops, or a pyelitis or a nephritis sets in. At the present time his condition is good, and

he should be able to stand the shock of an operation even as severe as that of prostatectomy and make a good convalescence. It seems to me that frequently we do not endeavor sufficiently to estimate the true condition of our patients before putting them to the test of an operation. We are too frequently satisfied with an evidently good heart, lungs and kidneys, a satisfactory pulse, with a good blood count, with a blood-pressure relatively normal as a standard acceptable for operation. I believe we should go considerably farther, particularly in the more difficult cases where we know that shock is likely to be great.

There is perhaps nothing that is so feared in our operative work as shock. The elements that are of greatest importance in the production of this condition I believe are the following: fear of the patient of an operation, intestinal intoxication and acidosis, anæsthesia, undue and rough handling of the parts being operated upon, hemorrhage, and pain incident to the immediate post-operative period. If they are as important as the experimental work indicates, we ought to use every means in our power to avoid them.

Beginning early, we should carefully prepare the intestinal tract to decrease the amount of putrefaction. This is done by carefully regulating the diet, by a liberal intake of water and by free elimination. It should be done for several days or weeks, if found necessary, in the individual case, preceding the time of operation. If it has not been carefully followed out, I consider it unwise to give the night preceding operation, the customary laxative which tends to keep the patient awake and also tends to increase the putrefaction in the bowel by churning up its contents. I much prefer a simple bowel flushing on the night before, and the morning of, the operation.

As the time for operation approaches we should endeavor to calm the fears of the patient as much as possible. Those who have gone through a period immediately preceding an operation appreciate the tension under which these patients lie in bed while waiting the appointed time. This can be very readily relieved by the use of small doses of heroin, codein or morphin, and I find that the slight danger from the bad effects of these drugs is not to be compared with the direct value derived from their use.

The anæsthesia is extremely important. When one sees an anæsthetic given as it sometimes is, with alternating periods of deep and

shallow narcosis, the chills run up and down one's spine. A careful, gradually administered anæsthetic, with equally sustained administration throughout, produces the least amount of subconscious shock, and brings the patient back to a consciousness of his surroundings in the best possible condition.

The next point is of greatest importance for the consideration of the operator himself. It is that of handling with the greatest degree of delicacy every part that he has to touch. If his patient were awake, in full possession of his senses and sensations, and if he were a man of some physical proportions, I question very much if the handling of the parts would be carried on as freely and as carelessly as they sometimes are when there is no opportunity for the patient to resent it. We should not forget that the subconscious sensations may be just as injurious in the production of shock as those sensations of which we are conscious, and therefore I would urge every man doing surgical work to treat his patient as though he or she, as the case may be, were wide awake and able to resent any undue roughness of manipulation or traumatism to the body.

Another point which I would like to emphasize is the desirability of decreasing the post-operative pain. I think there are few physicians who would be willing to suffer the pain incident to operations which we permit our patients to suffer, particularly when we know that a great deal of this suffering can be alleviated. I always tell my interne that I would not stand the pain myself, and I should not expect my patients to stand it. I appreciate the fact that this may appear to give my internes or my nurses too great liberties with narcotics, but I do not recall a case where I felt that this privilege was abused. If you are expecting the coöperation of your interne and your nurse, you should take them into your confidence, and in doing so you put them on their honor not to betray your confidence. This has a salutary effect upon them, but it has the more desirable effect of giving your patient comfort when it is needed.

We will do a perineal section on this man, and we will do it as a one-step operation. There are two methods of attack of the prostate, the suprapubic and the perineal. We will not go into a discussion of the merit of either method at this time: each one has its advantages and disadvantages in the individual case. Personally, I believe there are very few cases that really require a suprapubic operation, and

that almost all cases that are thus done could be done just as well through the perineum. The one-step operation by the perineal route will often demand in the septic cases some preoperative irrigation and drainage, but I believe it will be seldom found not to clear up under careful preoperative treatment. The perineal route, I believe, has the additional advantage of a better and shorter drainage and less morbidity.

We will first irrigate the bladder with a few quarts of boric acid solution. We now insert a large sound into the bladder and insist on an assistant pressing it down and backward to bring the prostate toward the perineum. We make the usual horseshoe incision (Fig. 1) through the skin and fat, resecting the superficial tissues. We cut the median raphe transversely without injuring the bulb and retract the same. With blunt dissection we can separate down to and expose the prostate. At this point it may be considered wise to make a median incision through the urethra and enter the bladder. A large number of cases do not require this incision. The capsule of one lobe (Fig. 2) of the prostate is now cut with a scalpel. Forceps are applied to the cut edge, and, using the finger as a dissector, the capsule is separated from the gland. This is easily done, except in those cases where we find a markedly hard, fibrosed gland with thick trabeculæ running in from the capsule, or where we have had abscesses or chronic infections of the prostate. In cases of firm fibrous strips of trabeculæ, it is wise to clamp them with artery forceps and to cut with scissors rather than to use too much force in separating them with the fingers. We thus produce less shock; we damage less the surrounding tissues, and the hemorrhage is always under control. Sometimes we find the Ferguson biting forceps invaluable in the markedly fibrosed type of prostate which does not enucleate readily, and in which the gland has to be removed piecemeal. Sometimes also the soft adenomatous gland is more readily removed piecemeal because the tenaculum forceps tears through the gland tissue and because the fingers in enucleating tend to break it up. Again, we may find small portions of the gland adherent to the capsule after the gross part has been removed, and these are best removed by the biting forceps. In case of abscess or infection of the prostate, one will find considerably more difficulty in making the separation. As the gland shells out, it is seized by tenaculum forceps under traction while the enucleation continues.

There is frequently difficulty in separating it from the bladder because of thick trabeculæ and because of hemorrhage, this being the point of entrance of almost all the vessels. For the same reason it requires great care, in order to be able to control the hemorrhage readily. Again, when we separate the prostate from the urethra, we must produce a minimum of trauma, endeavoring to leave all of the mucous membrane. Frequently it is torn, but if sutured over the retention catheter it produces little damage. One must be careful in dissecting around the bladder that the finger is not passed through the capsule into this viscus.

We now pass over to the lobe on the opposite side and proceed with it as we have done with the first lobe. We remove the sound from the urethra and insert the finger through the urethra into the bladder. If we find here the middle lobe protruding into the bladder, we turn it down through the urethra and enucleate it. These middle lobes are usually pedunculated and are readily removed.

Much discussion has taken place with reference to saving or destroying the seminal vesicles. The chief problem in men of prostatic age is not the conservation of the procreative powers, but the conservation of life, with a return to health in so far as the existing conditions permit; consequently, I feel that the conservation of the seminal vesicles is not essential, although desirable. Working on this basis I have endeavored to preserve them and their ducts leading to the floor of the urethra through the interlobar fascia. It is not an easy thing to do, nor should it be considered as a probability, but one should make a careful dissection in an effort to do it. When I put the question to my patient of saving the seminal vesicles or doing a radical operation, the latter is always chosen, providing both cannot be accomplished.

I will now show you the bed from which we have taken the prostate. Here is the capsule of the right lobe with forceps around the edge of it. Here is a forceps on the trabeculæ from the bladder wall which we will now tie off, thinking it may have some vessels that are worth securing. Here is a forceps on the cut edge of the urethra, and you will notice that my forceps passed through into the urethra at this point. We will now put forceps similarly on the capsule of the left lobe. We have no forceps on suspected bleeders on this side. You will note also that we have the hemorrhage practically checked.

I now insert a large soft rubber catheter through the penis into the bladder. This does not need to be a retention catheter, but should have a large opening in the vesical end. We wash out the bladder with normal salt solution so that no blood clot may be left therein to form the nucleus for a calculus.

We will suture the cut edges of this urethra over the catheter, and you will observe that they come together without tension except at one small point. I believe that this urethra will give us a very excellent one without stricture in our final result.

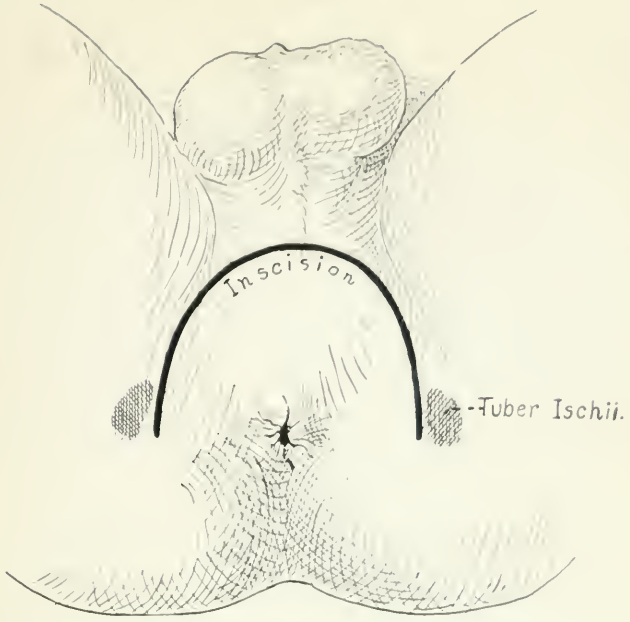
We now close the perineum in layers with catgut, inserting one cigarette drain up to the base of the prostate. I am not packing the capsule because I think the hemorrhage is not severe enough to demand it, and the slight oozing that is present I will take care of by pressure on the perineum. The slight excess will find its way out along the cigarette drain. I do not want to pack the capsule for another reason. The greater the amount of packing that is inserted the greater the amount of fibrosis that is produced, and the greater the danger for contraction and stricture is found. I believe we will do well to leave packing out of more of these cases and to overcome the danger of hemorrhage by a firm pyramid-shaped pad applied with pressure on the perineum, forcing the coaptation of the tissues to each other.

We will close the skin with silkworm-gut sutures, leaving the ends long so that they will not stick into and irritate the patient (Fig. 3).

Our first dressing is a small piece of gauze saturated with 1 per cent. lysol solution. This tends to prevent infection and decreases the irritation of the region.

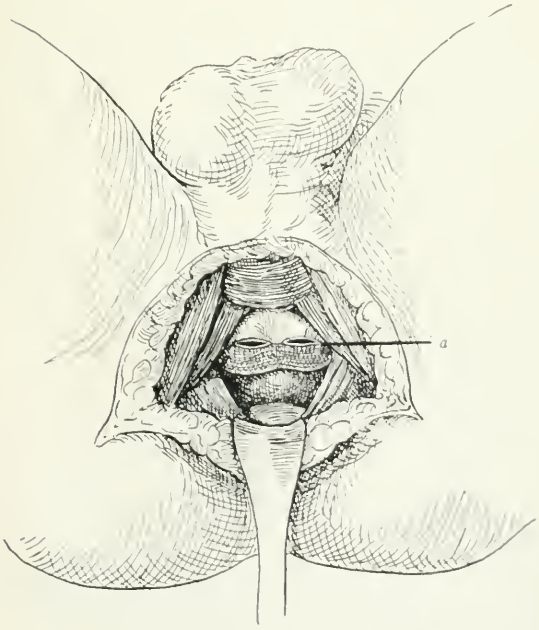
I now build up from here an inverted pyramid (Fig. 4) sufficiently high that when I put my T bandage on, or, what I prefer, an x-adhesive bandage which crosses directly over the wound, that I can bring pressure to bear against my perineum. The patient is now put to bed and every means adopted to decrease the shock. We will give him proctoclysis by the drip method with 10 per cent. glucose therein. We will give him water by mouth just as quickly as he is out from the anæsthetic, and we will prevent his suffering by the use of heroin in 1/8-grain doses, administered as often as every four hours, if necessary, providing no contraindications arise.

Fig. 1



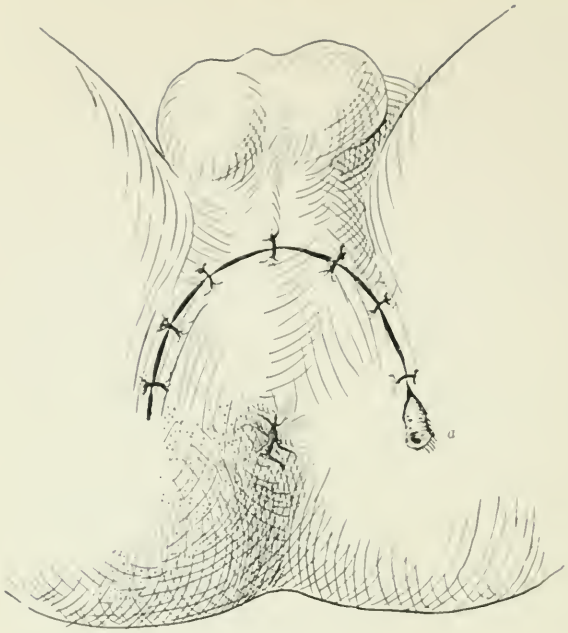
The horse-shoe incision.

Fig. 2.



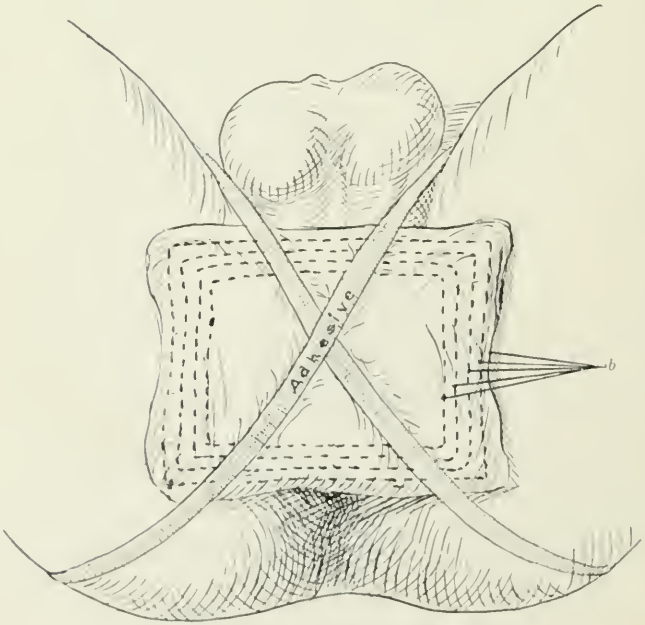
a. Incision through capsule of prostate gland.

Fig. 3.



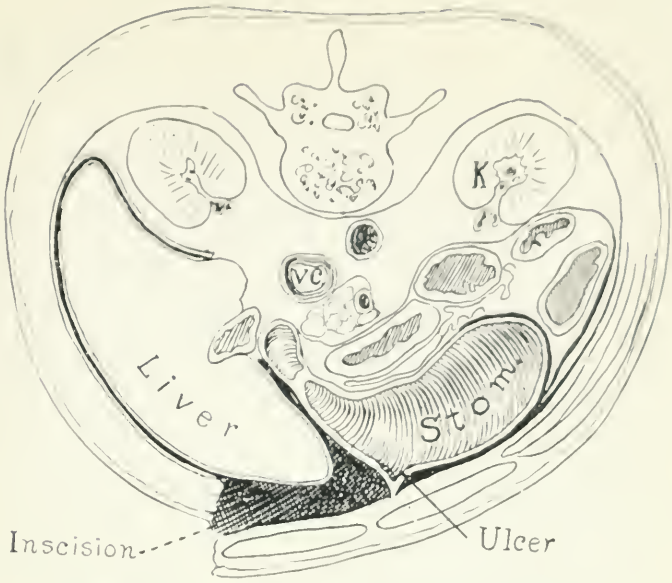
a. Gauze drain.

Fig. 4.



b. Pyramid shaped gauze dressing.

Fig. 5



Adhesion between the gastric wall and anterior abdominal wall

Fig. 6.

Gastric ulcer.

You will notice that this man has relatively little shock. He has a good color and good pulse. He has had but little hemorrhage, and at the present time gives good promise of an early recovery.

CHOLECYSTITIS COMPLICATED BY SUBACUTE PERFORATING ULCER OF THE STOMACH

Case 4875.—J. F., aged forty-two, has been complaining of epigastric and right hypochondriac pain for some ten days. The attack came on as a subacute indigestion consequent upon an indiscretion in diet. As it appeared for several days to be no different from other attacks, she did not worry until, as she states, it failed to respond to the usual digestants. The pain has no relation to the taking of food. She has not vomited, nor is she nauseated. Three days ago she had a more acute attack, which was characterized by sharp pain in the epigastrium and a slight chill, following which she appeared to have a fever. I saw her in consultation and found her with a temperature of 100°, pulse 92 and respirations 20. Her tongue was coated white, and was dry in the centre. Her lungs were clear; her heart was good. She had a diffuse epigastric tenderness, with a marked pain in the right hypochondrium. This latter could be located in the region of the gall-bladder. Deep palpation with the hooked fingers in the right hypochondrium was strongly resented. As she stoutly maintained she had on more than one occasion been as sick as this in just the same way, we agreed to wait a few hours.

The next morning there appeared to be no alteration in the condition. The succeeding two days were similarly passed, but on the fourth day the temperature rose to 101°, and pulse to 110; the tenderness became markedly greater in the right hypochondrium; the gall-bladder was not palpable, but was very sensitive in its deep position. There was increasing tenderness in the right epigastric region. The leukocyte count was 14,500, with 81 per cent. polymorphonuclears.

The question arises in this case whether there is a simple streptococcus infection of the gall-bladder, with or without gall-stones, or some complicating infection probably extending to the pancreas; that is, whether the pain in the epigastrium is referred or real. This is a question which will be settled when we enter the abdomen. The epigastric pain appears too superficial for an inflamed pancreas. The location and indigestion history might make one suspect the presence

of an ulcer, but the lack of symptoms in relation to food intake, of vomiting or other indications of ulcer are absent.

There are no indications of cancer. The age, the appearance of the patient, the length of time of development, the subacute recurring attacks, with intervening periods in which she is well, contraindicate the probability of cancer. I believe we have a streptococcus infection of the gall-bladder as our primary important condition and I believe whatever complicating conditions may be found at operation may be taken care of at that time.

One might suggest that an X-ray and the barium meal would be of value to us in this case. I believe that it would, but I think she is too acutely sick to subject her to the handling at operation of the intestinal tract full of barium.

As she has an acute surgical abdomen, with almost definite indications demanding operation, and as any complicating conditions will probably be in the immediate neighborhood, I think we are perfectly justified in waving the use of the barium meal and X-ray. I think we could perhaps use pneumoperitoneum to some and better advantage, but I do not think that it would in this individual case teach us anything of importance. It might make it possible for us to outline the gall-bladder, and it would make it possible for us to show any adhesions which might be forming to prevent the perforation from an ulcer, but I do not think it would give us a sufficient amount of information to warrant its use.

Operation.—We make our incision through the right rectus from the costal margin downward three inches, cutting to the peritoneum. Hemorrhage is carefully checked, in order to keep from the peritoneum as much of the blood as possible. The gall-bladder is brought up and found enlarged, long, thick-walled and impossible to empty. There appears to be no pus nor stones in the same. The ducts apparently are not obstructed. There are no adhesions. The pancreas appears normal in size, shape and consistency. An interesting point here is an adhesion between the anterior gastric wall and the anterior abdominal wall (Fig. 5). There is a narrow, cone-shaped portion of the stomach, the base of which is about three-quarters of an inch in width, and the apex a mere point adherent by a very small attachment to the anterior abdominal wall. As I lift the edge of the incision you can see what I am speaking about. This adhesion is quite

firm, and it is with difficulty that I can break it down. I must do so carefully because I do not want to unnecessarily traumatize the stomach. Now, I bring it into view, and we find a very small opening into the gastric lumen (Fig. 6). This is the site of a small perforating gastric ulcer which fortunately has come against the abdominal wall. I say fortunately because it has prevented the gastric contents from pouring out into the peritoneal cavity and producing a general peritonitis. This gives us an explanation of our epigastric distress which at no time amounted to a real pain.

Gastric ulcers in the anterior abdominal wall near the lesser curvature, where this one was placed, produce little pain response to the touch of food. Even an acute type of ulcer gives a very mild pain picture. As the process worked its way through and reached the peritoneum, the usual peritoneal response to irritation was produced, and the patient complained of an epigastric distress or discomfort. The previous attacks of gastric distress of which you may remember she complained, were doubtless due to indigestion or to slight erosions of the mucosa.

I cannot find any evidence of healed ulcers which would indicate that she had had previous attacks, and yet one hesitates to make an assertion that she did not have other small ulcers.

We will cauterize this opening and ligate it. Now, we will insert a purse-string suture around this ligature and one-half inch away from it and invert the whole mass into the stomach. We will drop the stomach back into the abdomen. It is unusual to find a perforation as this is with so little surrounding peritoneal reaction and infiltration. It is also unusual not to find the omentum endeavoring to wall off this perforation. It is quite possible that some omental adhesions to the peritoneum in the lower abdomen may have been the cause of preventing the omentum from functioning.

An examination of the pylorus indicates that we have a perfectly normal and functioning pylorus.

We now return to the gall-bladder. I think this is one of those gall-bladders which we will do well to remove. The history of chronic irritation, of periodical attacks of what are presumed to be indigestion, the thickening of its walls, the difficulty of emptying it, all lead me to feel that this gall-bladder is better out than in. We do not need to enter into a discussion as to the relative merits of

cholecystectomy and cholecystostomy. They both have their supporters and rightly so. It seems to me that there is a place for each procedure, but this case belongs to the list of those requiring excision. I do not believe that we can drain these cases of streptococcus infection of the gall-bladder wall sufficiently long to get rid of the infection in the bladder wall and therefore I remove them.

A ligature is placed around the cystic duct as close as we can get it to the common, and a second one is placed around the cystic vessels. I do not always think it is necessary to put on two ligatures, but I believe it is usually the wiser plan. We now cut between this ligature and the forceps which are on the distal end, and I cauterize the stump with carbolic acid, followed by alcohol.

I now make an incision through the peritoneum and the subserous tissue, passing up from the duct along the wall of the gall-bladder near the junction with the liver until I reach the fundus, then I return to the duct, and do likewise on the opposite side. I endeavor to leave a sufficient amount of peritoneum to cover over the raw surface in the liver left by the removal of the gall-bladder. Then I begin at the neck of the gall-bladder and enucleate from the under-surface of the liver until I reach the fundus. Sometimes it will be found considerably easier, after having ligated the cystic duct, to begin the enucleation at the fundus and work down to the duct. I think the individual case is the guide at the time of operation.

I now replace the peritoneum over the raw surface of the liver, and, if necessary, I put in a few fine catgut sutures. Usually, however, this peritoneum will readily adapt itself and adhere to this raw surface and sutures are not necessary.

We now close the abdomen without drainage. This is another question which is receiving much discussion at the present time, but I believe that closure without drainage is the logical procedure. For a long time we were draining almost all of our appendix cases, but we found out that many cases which were being drained did better without drainage, until we have come to the point where we drain very few cases of appendectomy and only those that have a markedly infected or soiled peritoneum, knowing that nature does a great deal to supplement the work which we are weakly trying to do. For a long time we felt every gall-bladder case should be drained, and that excision was an extremely radical procedure. To-day we consider an

ectomy almost as simply as an ostomy. I think in a short time we will go still further and drain none or very few of our cholecystectomy cases. Drainage always has its disadvantages, because it produces adhesions and leaves behind conditions which are more or less disabling. Therefore, I think we should eliminate this as far as possible. The peritoneum will take care of any small amount of oozing. There is no focus of infection which was not present previous to operation, and we have no reason to suspect that a lack of drainage will produce peritonitis. I therefore think we ought to give nature a little opportunity to do what she can to help us out.

The abdomen is closed with catgut sutures until we reach the skin, and then we use horsehair or silk for careful coaptation. In stout people it may be necessary to insert three or four deep tension sutures.

In order that these cases should not be disturbed for a time subsequent to operation, I apply a dressing of gauze saturated with 1 per cent. lysol solution and leave it for a week or ten days before I do my redressing; at the same time the stitches may be removed, and the patient allowed to get up.

Immediately after operation she is given a hypodermic injection of heroin, grain $\frac{1}{8}$, and is not allowed to suffer pain for three days, at the end of which time I eliminate all narcotics and substitute, if necessary, normal salt.

You will notice that this patient is in good condition. She has had relatively little shock. Her skin is dry and color good; her pulse is 96. I do not think that she requires normal salt per rectum nor stimulation of any kind. She will now be returned to her bed and made as comfortable as possible.

INFLUENZA AND ITS COMPLICATIONS IN CHILDREN *

A REVIEW OF 860 CASE HISTORIES IN THE COOK COUNTY HOSPITAL, INCLUSIVE OF THE EPIDEMICS OF 1918–1919 AND 1920

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THE following report is based on a study of the case histories and personal observation of influenza and pneumonia in children up to the age of thirteen years, during the epidemics of 1918–1919 and 1920 in the Cook County Hospital. An attempt has been made to note the prominent features of each epidemic and to compare them. To secure a rational understanding of the statistics herein quoted, the conditions under which the epidemics were observed will be explained.

A short time after the onset of the pandemic in the middle of September, 1918, a very high percentage of the civil population of Chicago were stricken, so that within two weeks the private hospitals were filled to capacity. At the same time it was almost impossible to secure nurses. As a result patients from all walks of life began to enter the Cook County Hospital in large numbers, even though it was a charitable institution. In the period from September 23 to October 29, 1918, there were close to 2000 influenza and pneumonia admissions. With the hospital filled to capacity and with many of the nurses and resident physicians ill, the problem of caring for the sick became very serious. The hospital authorities accordingly decided to accept only those who were seriously ill. In a large number of cases, the patients were already in a moribund condition. Many of the children admitted were from families where the parents had succumbed, and a large number were unaccompanied by anyone who could give a history. It was early decided that the Children's Hospital, with a capacity of 150 beds, should be reserved for cases

* Read before the Chicago Pædiatric Society, March 9, 1920.

† The writer is indebted to Dr. J. H. Hess for suggesting this paper, to the library staff for assistance with the histories, and to Dr. Craig Butler for criticism of this year's report.

Age	Influenza Cases		Pneumonia Cases	
	1918-1919	1920	1918-1919	1920
1 month and less	2	0	0	0
1-6 mos	7	2	13	4
6-12 "	16	4	19	10
1-2 yrs.	36	15	46	10
2-3 "	41	15	43	5
3-4 "	49	11	25	8
4-5 "	33	10	33	5
5 6 "	30	6	20	7
6-7 "	30	9	22	6
7-8 "	35	3	20	0
8-9 "	25	10	14	0
9-10 "	28	2	14	3
10-11 "	27	5	10	1
11-12 "	20	2	6	1
12-13 "	17	1	8	1
Total	396	95	293	61

Table I. Influenza and Pneumonia Admissions with reference to Age.

other than influenza and pneumonia. As a consequence the little patients were sent to large wards as rapidly as they were admitted, and the hospital records were rapidly written and fine details omitted.

It necessarily follows that the mortality figures were much higher than those observed in private practice.

In the present year all cases were cared for in the Children's Hospital and the records are much more accurate.

ADMISSIONS

1918–1919: Of a total of 3500 cases of influenza and pneumonia (all ages), there were 689 in children up to the age of thirteen years. This includes the period from September, 1918, to February, 1919.

1920: In the present year 156 children were in the hospital with influenza or pneumonia. This was in the period from the middle of January to the middle of February, in which there was a total of about 1500 for all ages.

The distribution of cases for both epidemics is shown in the table and chart on page 65.

We note that the maximum number of influenza admissions in 1918–1919 was in the 3- to 4-year period and that almost half the total number of cases is included in the period up to 5 years (184 of 396). In 1920 the maximum for influenza is greatest in the 2- to 3-year group, and more than half of all admissions were up to 5 years (57 of 95). However, there is a certain similarity in both curves, indicating that the relative percentage of admissions for each age was very much alike in both epidemics.

The pneumonia curves bear a resemblance to the influenza, and indicate that the maximum admissions were in the 1- to 2-year group. In the period to 5 years the majority of cases occurred, being 65 per cent. in 1918–1919 (179 of 293) and 68 per cent. in 1920 (42 of 61).

In both epidemics the number of pneumonia cases was less than that of influenza. We must conclude from the above statistics that there was a predilection for children up to 5 years, that very young infants, under one month of age, were comparatively immune, and that after 10 years of age the incidence was small.

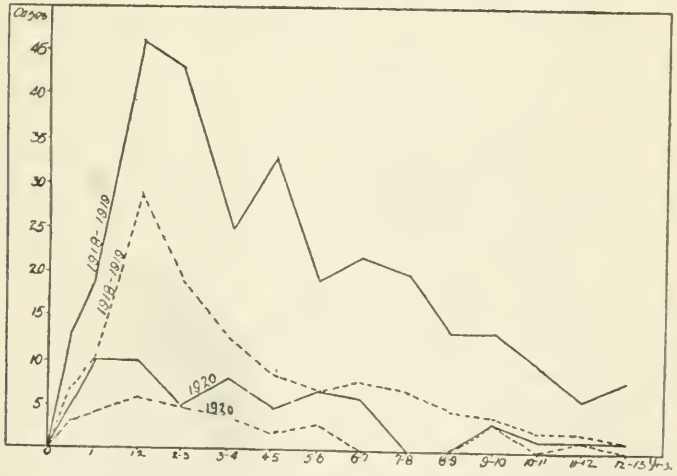
MORTALITY

The total mortality of the Cook County Hospital for all ages has been reported by Nuzum and his collaborators [1] as 31 per cent.,

[1] Nuzum *et al.*, "Pandemic Influenza and Pneumonia in a Large Civil Hospital." *J.A.M.A.*, 71; 1562, Nov. 9, 1918.

Age	Pneumonia Cases		Deaths		Percentage Mortality	
	1918-1919	1920	1918-1919	1920	1918-1919	1920
1 month and less	0	0	0	0	0.0	0.0
1-6 mos.	13	4	7	3	53.8	75.0
6-12 "	19	10	10	4	52.6	40.0
1-2 Yrs.	46	10	29	6	63.0	60.0
2-3 "	43	5	19	5	44.1	100.0
3-4 "	25	8	13	4	52.0	50.0
4-5 "	33	5	9	2	28.1	40.0
5-6 "	20	7	7	3	35.0	42.8
6-7 "	22	6	8	0	36.3	0.0
7-8 "	20	0	7	0	35.0	0.0
8-9 "	14	0	5	0	35.7	0.0
9-10 "	14	3	4	3	28.5	100.0
10-11 "	10	1	2	0	20.0	0.0
11-12 "	6	1	2	1	33.3	100.0
12-13 "	8	1	1	0	12.5	0.0
Total	293	61	123	31	41.9	50.8

Chart II. Based on Table II. Solid Lines = Pneumonia Cases. Dotted Lines = Deaths.



and by Keeton and Cushman [2] as 39.3 per cent. The figures for children follow.

There were no deaths reported from influenza proper either in 1918–1919 or 1920. This is exclusive of pneumonia.

The cases of epidemic pneumonia are noted in the table and chart on page 67.

From the above-mentioned table and chart we note that the mortality in 1918–1919 was 41.9 per cent. (123 of 293 cases) and 50.8 per cent. in 1920 (31 of 61 cases). The figures for 1920 cannot be accepted as being of as much value as those of the preceding year, because of the smaller total of pneumonia patients and the fact that all children in the 2 to 3, 9 to 10, and 11 to 12 year groups died. It is also seen that in both epidemics infants were immune. The crest of the mortality curve rises to its maximum height in both epidemics in the 1- to 2-year group and runs parallel to the incidence of cases. The maximum mortality in both years was seen in the period up to 5 years (70.7 per cent. in 1918–1919, and 77.4 per cent. in 1920 of the total mortality) and is almost equal. After 5 years the total mortality rapidly decreased, so that the conclusion may be warranted that the older children were better able to resist the infection.

BACTERIOLOGY

1918–1919: There were no bacteriological studies carried out with special reference to children. Nuzum and his collaborators [1] made "more than 3000 blood agar plate cultures from swabs of the nasopharynx, tonsils and washed, selected, bronchial sputum and from the viscera and body fluids at necropsy in search for the influenza bacillus or other microörganisms of possible etiologic significance. The influenza bacillus was isolated in only 8.7 per cent. of the total cases and chiefly from a small number of soldiers. In one instance, it appears that the influenza bacillus may have caused the fatal broncho-pneumonia. Influenza bacilli were isolated only exceptionally from the civilian patients. Pneumococci were the predominating organisms in the sputum, throat cultures and in the lung cultures, both during life and at necropsy. Pneumococci of unusual virulence were the most important early secondary invaders, and have sufficed to cause many of the fatal pneumonias. Experiments indicate that the

[2] Keeton and Cushman, "The Influenza Epidemic in Chicago." *J.A.M.A.*, 71; 1962, Dec. 14, 1918.

disease is apparently not due to a filtrable virus." The other organisms found in order of frequency were: staphylococcus, streptococcus hæmolyticus, micrococcus catarrhalis.

1920: Small and Stangl [3] studied the bacteriology in the present year. In their first series of cases B. influenzæ was recovered in 100 per cent. of the series, pneumococcus in 72.7 per cent. and hæmolytic streptococci in 9.1 per cent. In a second group of 45 cases of acute influenza B. influenzæ was identified in 95.5 per cent. from cultures of throat and sputum. They noted the presence of B. influenzæ in 70 per cent. of thirty controls and conclude that the relative high incidence of the organism in this group is comparable to the findings during the pandemic of 1918 and may be regarded as illustrating the wide dissemination of these organisms during epidemic periods. In a series of 32 influenza-pneumonia cases they found B. influenzæ 75 per cent., pneumococcus 84.4 per cent., and hæmolytic streptococci 18.7 per cent. The high incidence of type IV pneumococcus was in accordance with the findings reported for the pneumonia of 1918. Hæmolytic streptococci appeared only among the cases studied within the latter half of this year's epidemic. Small and Stangl feel that their studies are too incomplete to enable one to draw conclusions, but wish to emphasize the relatively higher percentage of incidence of B. influenzæ in 1920.

PATHOLOGY

1918–1919: The features of morbid anatomy for all ages, as noted in the hospital by Le Count [4] and Nuzum,[1] were:

The first feature of the lungs in influenza to attract attention was the relatively small amount of lung tissue solid with grossly demonstrable pneumonia. Ranking in importance with this was the huge, often thin and watery, bloody exudate in the lung tissue, bronchioles, and in one or both pleural cavities—more, as a rule, on the side of greater lung involvement. This blood-tinged fluid was remarkably free from fibrin content. The pleura of the lungs was fibrin free and regularly the seat of petechial and confluent hemorrhages. On cutting transversely across the trachea to reflect the viscera from the thoracic cavity, large quantities of blood-tinged, frothy fluid exuded

[3] Small and Stangl, "The Bacteriology of Epidemic Influenza." *J.A.M.A.*, 74, No. 9, Feb. 28, 1920.

[4] Le Count, E. R., "The Pathologic Anatomy of Influenzal Bronchopneumonia." *J.A.M.A.*, 72; 650, March 1, 1919.

from the air passages. The lining of the trachea and main bronchi presented a deep purplish-red, and this intense inflammatory condition extended downward into the finest bronchioles. The consolidation was always lobular in type with predilection for the periphery of the lungs, and involved most frequently the lower lobes, less often the entire middle and lower half of the right upper lobes. Marginal compensatory emphysema presented itself with striking regularity. The peri-bronchial lymph-glands were acutely swollen and œdematous. Cut surfaces of the lung presented a mottled, firm, granular appearance, with intervening areas of dark red aerated lung tissue. The liver and kidneys were heavier than normal and the seat of fatty changes and parenchymatous degeneration. Another feature of influenza was that the spleen was not as large as in lobar pneumonia. Passive hyperæmia of the pia-arachnoidal vessels over the cerebral cortex and œdema of the leptomeninges were not uncommon. Less constant were generalized icterus; early appearance of staining of the lining of large blood-vessels by laked blood; patches of necrosis of the larynx or trachea lining; hyperplasia of the lymphoid tissues of the thorax and neck; slight acute sero-fibrinous pericarditis; acute interstitial emphysema of the lungs and mediastinal tissues, or of these with the subcutaneous tissues as well; otitis or accessory (nasal) sinus inflammation, or actual suppuration as small abscesses in the lungs.

1920: Post-mortem examinations in the present year were far less numerous. In comparison with 1918–1919, it may be stated that this year the influenza pneumonias were characterized by more of fibrin in the pleura and by less of fluid in the lungs. There was more pneumonia and less œdema. These facts are associated with the longer course and the absence of acute deaths.[5]

CLINICAL PICTURE

In the previous reports of Nuzum and his collaborators, and Keeton and Cushman, the composite clinical picture was presented as noted in patients of all ages, including children and adults. In the report which follows, the outstanding features of influenza and pneumonia in the group up to thirteen years of age will be considered.

[5] Oral communication from Dr. E. R. Le Count.

INFLUENZA

There were no calculations as to the average number of days spent in the hospital by the influenza patients in the 1918–1919 epidemic. However, the 1920 cases averaged between 5 and 8 days.

A history of influenza or pneumonia infection in the family was elicited in 42 per cent. of the 1920 cases. It was impossible to secure records in the previous epidemic.

NASAL SECRETIONS

Age	Lessened or Normal		Profuse		Total	
	1918-1919	1920	1918-1919	1920	1918-1919	1920
To 6 mos.	6	1	3	1	9	2
6-12 "	10	1	6	3	16	4
1-2 Yrs.	25	11	11	4	36	15
2-3	31	12	10	3	41	15
3-4	40	9	9	2	49	11
4-5	28	8	5	2	33	10
5-6	27	4	3	2	30	6
6-7	28	9	2		30	9
7-8	35	3			35	3
8-9	23	6	2	4	25	6
9-10	27	2	1		28	2
10-11	26	4	1	1	27	4
11-12	18	2	2		20	2
12-13	17			1	17	1
Total	341	72	55	23	396	95

1918–1919: In the series of 396 influenza cases, we note that the nasal secretions were lessened or normal in 341 instances and profuse in 55 (13.8 per cent.).

1920: Of 95 cases, nasal secretions were normal or lessened in 72 and profuse in 23 (24.2 per cent.).

From these figures it would appear that profuse nasal secretions

were more common this year (10.4 per cent.). However, we are dealing with a much smaller series (1920) and the comparison cannot be accepted as conclusive.

RESPIRATORY AND EAR FEATURES

Age	Total No. Cases		Redness & Dryness of Pharynx		Tonsillitis		Cervical Adenopathy and Adenitis		Epistaxis		Pleuritis		Otitis Media	
	1918 1919	1920	1918 1919	1920	1918 1919	1920	1918 1919	1920	1918 1919	1920	1918 1919	1920	1918 1919	1920
To 6 mos.	9	2	3	1	1	1	1							
6-12 "	16	4	7	3		1	1				1		3	
1 to 2 yrs	36	15	7	13		7	4		1					3
2-3 "	41	15	14	9	1 Diphtheria	8	14	2			3		1	
3-4 "	49	11	26	8	1	6	13	1		1				1
4-5 "	33	10	13	8	0	5	9	1		2	1			2
5-6 "	30	6	11	4	1	4	6				1			2
6-7 "	30	9	14	4	0	2	6				2			1
7-8 "	35	3	14	3	1	3	3		3		2			
8-9 "	25	10	10	7	4	7	5	1	3	1	1			3
9-10 "	28	2	6	2	1	2	3		1		1		1	
10-11 "	27	5	8	3		1	3		4	2	1			
11-12 "	20	2	4	1			1		3				1	
12-13 "	17	1	3				1		1		2		1	
Total	396	95	140	66	10	47	70	4	16	6	15	0	7	

1918–1919: The table of respiratory and ear features, in order of frequency, shows therefore:

1. In 140 of 396 cases redness and dryness of the pharyngeal mucosa was sufficiently marked to be worthy of notation (35.3 per cent.).
2. Enlargement of the cervical glands (adenopathy) and adenitis was seen in 70 cases of 17.6 per cent.
3. Epistaxis was directly observed in but 16 cases, or 4 per cent.
4. Pleuritis was diagnosed in 15 cases, apparently free of pneumonia, or 3.7 per cent. These figures are, however, doubtful.
5. Follicular tonsillitis occurred 10 times (1 case of diphtheria), or in 3.9 per cent. of the total (simple redness and swelling were not noted).
6. Otitis media occurred in 7 instances, or 1.7 per cent.

1920: The summary of the respiratory complications follows:

1. Redness and dryness of the pharynx was recorded in 66 of 95 cases, or 69.4 per cent., practically twice the frequency of 1918–1919.

2. Bronchitis was observed in close to 75 per cent. of the cases and represents the most common respiratory complication or symptom.
3. Involvement of the tonsils in a follicular or simple inflammation was present in 47 of the 95 cases, or 49.4 per cent., contrasting with 3.9 per cent. of the previous epidemic (however this figure is exclusive of the cases of simple tonsillitis).
4. Otitis media occurred in 12 instances (12.6 per cent., or 7.4 times that of last year) This figure is in keeping with the relatively greater percentage of this year's pharyngitis and tonsillitis.

Age	Normal		Leucopenia		Leucocytosis		Total	
	1918-1919	1920	1918 1919	1920	1918-1919	1920	1918 1919	1920
To 6 mos.	1					2	1	2
6-12 "	4	1		2	1	2	5	5
1-2 Yrs	8	2		4	4	4	12	10
2-3 "	11	1		2	5	3	16	6
3-4 "	5		2	4	4	4	11	8
4-5 "	5	1	1	2	2		8	3
5-6 "	6	1		1	4	1	10	3
6-7 "	5	1	1	4	8	1	14	6
7-8 "	8	1	3	2	3		14	3
8-9 "	2		1	5	3	4	6	9
9-10 "	4		3	1	2		9	1
10-11 "	7			3	4		11	3
11-12 "	4	2	1		4		9	2
12-13 "	1		2		3		6	
Total	71	10	14	30	47	21	132	61

5. Epistaxis was seen 6 times (6.3 per cent.).
6. Cervical adenitis was noted in 4 cases (4.2 per cent.). The instances of well-marked adenopathy were not calculated.
7. There were no cases of pleuritis.
8. Cough, for which no careful figures could be secured in the last epidemic, was observed in 64 of the cases (67.3 per cent.). In many instances it was of a paroxysmal, pertussis-like character. There also was a tendency for the cough to persist.
9. Severe laryngitis was seen in 4 children.

WHITE BLOOD-CELL COUNTS

1918–1919: The white blood-cell counts in the influenza series numbered 132. Of this number, 71 were normal, 14 showed a leucopænia, and 47 a leucocytosis. Thus a normal or decreased count was present twice as frequently as an increased count. Differential blood studies were not carried out in a large enough number of cases to be of any significance.

1920: In the present epidemic of 61 counts, 10 were normal, 30 showed leucopænia and 21 leucocytosis. The lowest count observed was 3000, the highest 27,400. As in the previous year, normal count and leucopænia were twice as common as leucocytosis. However, leucopænia is more frequent this year, relatively 1 to 2, last year 1 to 9. Leucocytosis averaged 34 per cent. this year as compared with 35 per cent. in 1918–1919.

INFLUENZA

1918–1919: Other symptoms were:

1. Persistent vomiting was noted in but 4 of the entire series of cases (1 per cent.), although there was a large number of instances in which emesis had occurred a few times.
2. Profound prostration was seen in 23 cases of influenza (5.8 per cent.), uncomplicated by pneumonia; in the latter it was much more common.
3. Intermittent temperature, in the absence of physical findings of pneumonia, was recorded in a small number of cases (exact data not available). These cases were at first very confusing and necessitated careful differential diagnosis, especially from tuberculosis.
4. There were eight cases in which a rash appeared—of the toxic erythema type. In one instance the diagnosis was difficultly made from scarlatina.

4. (a) Early flushing of the skin was not observed because the patients came to the hospital with the disorder fully developed.

5. Convulsions occurred in six cases, between the ages of one and four years. There was no evidence of meningitis.
6. Constipation was noted in 113 of 689 cases (16 per cent.) of influenza and influenza bronchopneumonia. In addition, there were not a few cases of colitis, of varying severity, with pus, blood and mucus in the stools.

7. Secondary cyanosis in influenza proper was not evident. In one case in a child of eight, there was marked general duskiness in the absence of evidence of pneumonia or cardiac disease.

1920: Miscellaneous features were:

1. Chilliness or chills at the onset was recorded in 10 to 20 per cent.
2. A history of vomiting was secured in 19 cases (20 per cent.). Emesis occurred most often at the onset of illness and was more frequent in the children up to 4 years.
3. The profound prostration of the previous epidemic was not in evidence this year and cyanosis was absent.
4. Intermittent temperature in the absence of pneumonic findings was not as common this year.
5. One case of toxic erythema was seen and two with impetigo.
6. Diarrhœa was marked in three children, but there were no instances of the severe colitis of the last epidemic.
7. Constipation was present in 41 patients (43.1 per cent.), much more common than previously (16 per cent.).
8. Convulsions were seen but once—in an infant of 18 months.

GENERAL CONCLUSIONS—INFLUENZA

The influenza epidemic of 1920 was of much shorter duration (one month) than that of 1918–1919 (four months), and the total number of cases was smaller (95 in 1920, as compared with 396 in 1918–1919).

The relative proportion of influenza cases to total admissions in both epidemics was about the same (57.4 per cent. in 1918–1919 and 60.8 per cent. in 1920).

Influenza uncomplicated by pneumonia did not cause death.

Bacteriological studies have shown that B. influenzæ was recovered from a far greater number of cases this year than last, but that it is the exciting organism has not been proven.

The apparent greater frequency of respiratory complications of influenza, other than pneumonia, this year, may be explained on the basis of more careful observation and better records. However, the middle ear infections were far more marked this year.

The reaction of the patients to the infection with leucocytosis was as frequent in 1920 as in 1918–1919 (34 per cent., 1920, 35 per cent., 1918–1919).

The profound prostration, intermittent temperature, skin reactions and nervous system irritation of 1918–1919 was much less marked in 1920.

Gastro-intestinal disturbances were milder this year with the exception of constipation, which was more frequent.

PNEUMONIA

The features of the influenza pneumonia cases will be presented by systems.

PNEUMONIA CASES—TYPE AND DURATION

Age	Pneumonia Cases		Type of Pneumonia						Duration in Days (Influenza Days in Hospital)					
			Broncho-		Lobar or Pseudo Lobar		Mixed		Shortest		Longest		Average	
	1918-1919	1920	1918-1919	1920	1918-1919	1920	1918-1919	1920	1918-1919	1920	1918-1919	1920	1918-1919	1920
To 6 mos	13	4	11	4	1		1		1	2	12	15	7	8
6-12 "	19	10	19	8		2			3	2	18	12	7	7
1-2 Yrs	46	10	43	10	1		2		2	1	25	14	9	7
2-3 "	43	5	38	5	3		2		2	2	20	20	9	8
3-4 "	25	8	20	8	4		1		2	2	19	19	9	7
4-5 "	33	5	31	5	1		1		2	5	16	15	9	9
5-6 "	20	7	20	6		1			2	6	29	16	12	10
6-7 "	22	6	22	5		1			1	8	25	19	10	11
7-8 "	20		18		2				2		21		10	
8-9 "	14		13				1		3		24		12	
9-10 "	14	3	13	2		1	1		2	2	35	11	15	6.5
10-11 "	10	1	10	1					5	15	25		16	15
11-12 "	6	1	5		1	1			8	9	16		14	9
12-13 "	8	1	8	1					5	7	24		12	7
Total	293	61	271	55	13	6	9	0						

1918–1919: From this table it is seen that of 293 cases of pneumonia following influenza, 271 were of the broncho-pneumonic type (92.4 per cent.), 13 lobar or pseudo-lobar and 9 mixed. This is in accordance with the findings of most clinicians. The duration of the pneumonia cases averaged between 7 and 16 days. This included the course of influenza and pneumonia from history and observation and explains the columns of "shortest" and "longest" duration, the former referring to cases in which death occurred early and the

latter having reference to influenza and pneumonia. The average course was shorter up to the age of 5 years and this almost runs parallel with the mortality which was greatest up to that age. In addition 179 of the 293 cases studied were up to 5 years, so that apparently the younger children were more susceptible to pneumonia than the older, and further showed their lack of resistance by succumbing in a shorter period of time.

1920: There were 61 pneumonias this year, of which 55 were broncho-pneumonic (90.1 per cent.) and 6 lobar or pseudo-lobar. The broncho-pneumonic percentages of the two epidemics are almost equal. The average duration was from 7 to 15 days, and indicates the period in the hospital only. As in 1918–1919 the course was shorter in the period up to 5 years, and the greater number of cases occurred up to 5 years (42 of total of 61); in addition of a total of 31 deaths, 24 were seen in the period to 5 years. Thus the 1920 epidemic was also more disastrous to the younger children.

1918–1919: The appearance of pneumonic findings first in the lower borders of the posterior lobes has been reported by numerous observers, especially in the military camps. Our clinical observations in this respect are not accurate because the cases were usually seen with the pneumonia (broncho) fully developed. Nevertheless our records show this finding in 44 of 293 cases (15 per cent.) occurring at all ages, perhaps a little more frequently from 6 months to 4 years (6, 6, 5, 6).

No attempt was made to note the appearance of lobar pneumonia during the period of decline of the epidemic.

In some reports we find that there was a lapse of 1 or 2 days between the influenza and the beginning of the pneumonia, during the time that the child appeared to be convalescing. In our series, as previously mentioned, the pneumonias when seen were usually fully developed. However, the author can recall not a few instances in which this feature was present.

A persistent fever without complications in convalescent pneumonias was seen several times. This was more prominent during the period of decline of the epidemic and was more frequent than in the uncomplicated cases of influenza proper.

1920: Pneumonic findings appearing first in the bases of the posterior lobes were noted in 17 children (27.8 per cent.). This

figure is almost double that of the preceding epidemic and is perhaps accounted for by the more careful observation of this year.

There were no figures as to the length of time between the termination of the attack of influenza and the development of pneumonia. However, the general idea is that there was in many instances this year a well-marked interval period, in which the patients seemed to be improving, when suddenly pneumonia appeared. Last year the transition was much more abrupt.

The incidence of persistent temperature in the absence of complications of pneumonia was far less common this year.

WHITE BLOOD-CELL COUNTS IN INFLUENZA-PNEUMONIA

Age	Normal or Leucopenia	Normal	Leucopenia	Leucocytosis		Total	
	1918-1919	1920	1920	1918-1919	1920	1918-1919	1920
To 6 mos.	3			1	1	4	1
6-12 "	6	1	1	2		8	2
1-2 yrs.	7	1	2	8	2	15	5
2-3	10	1	2	7	3	17	6
3-4	5	3	1	8	1	13	5
4-5	7	1	1	14	1	21	3
5-6	5			6	2	11	2
6-7	2	2	2	9	3	11	7
7-8	4			8		12	
8-9	1			6		7	
9-10	4		2	5	1	9	3
10-11	6			4		10	
11-12	1	1		2		3	1
12-13			1	4		4	1
Total	61	10	12	84	14	145	36

1918–1919: Leucocyte counts were made in 145 cases, of which 61 were normal or decreased and 84 showed a leucocytosis. Thus in 58 per cent. of the cases, in which white blood-cells were examined, leucocytosis prevailed. This contrasts with the influenza cases in which a normal or decreased count was twice as frequent as leucocytosis. There were no differential studies.

In the period of highest mortality (to 5 years) we note that there

were 179 pneumonia cases (61 per cent. of total number), with 87 deaths (48.6 per cent. mortality). There were 68 leucocyte counts made in this series, of which 38 were normal or showed a leucopænia and 40 had a leucocytosis. In other words, we may conclude that the period of childhood to the age of 5 years as contrasted with the later years was characterized by an increased susceptibility to pneumonia, a higher mortality, and a lack of development of leucocytosis in half the cases.

1920: The white cell count was observed in 36 patients: 10 normal, 12 leucopænia, 14 leucocytosis. The lowest count was 3500, the highest 37,000. The outstanding feature this year is that a leucocytosis was present in a relatively smaller percentage of cases (38.8 per cent. in 1920, 58 per cent. in 1918–1919). One hesitates to draw conclusions from the smaller series of this year. The question though is open as to whether the lower incidence of leucocytosis this year bears relation to the higher total mortality (50.8 per cent. in 1920, 41.9 per cent. in 1918–1919).

RESPIRATORY FEATURES OF INFLUENZA-PNEUMONIA

1918–1919:

Epistaxis.—This was not as common as in adults and was recorded in but 13 cases of the series (4.4 per cent.).

Laryngitis.—The larynx was involved more frequently than noted in the histories. Intubation and tracheotomy were done in two cases, intubation alone in one case, and tracheotomy in two. Only one case recovered. In one diphtheria was demonstrated (intubation case), antitoxin given, with recovery.

Hæmoptysis.—Four children evidenced pulmonary hemorrhage (1.3 per cent.). In all instances it appeared early in the course of the illness.

Pleuritis.—Pleural irritation with friction rub was recorded in three cases (1 per cent.). There was no instance of a pleurisy with effusion.

Empyema.—Pus in the pleural cavity appeared in five patients (1.7 per cent.). The bacteriology was not followed out.

1920: The incidence of respiratory features in the pneumonia cases this year was:

Epistaxis	7 cases	11.4 per cent.
Laryngitis	3 cases	4.9 per cent.
(No intubation or tracheotomy)		
Hemoptysis	3 cases	4.9 per cent.
Pleuritis	7 cases	11.4 per cent.
Empyema	2 cases	3.2 per cent.

Our tabulations seem to indicate that the respiratory complications were more common this year. The figures of the two epidemics will be much more nearly equal, if we will recall that the complications, above noted, of last year were seen more frequently toward the end of the epidemic.

EAR AND SINUS COMPLICATIONS IN INFLUENZA-PNEUMONIA

1918–1919:

Otitis Media was observed in 14 cases (4.7 per cent.), of which 8 occurred up to 4 years.

Mastoiditis occurred in one case. The unusual features noted make it worthy of quoting in brief:

A girl of three years was admitted to the hospital October 8, 1920, with a history of having been ill 7 days with influenza. Temperature, 102° F. per rectum, pulse 126. On October 10 the examination disclosed broncho-pneumonia with involvement of all lobes except the left upper; the heart's action was weak, skin dusky and temperature was 103° F. During the next two days she improved. On October 10, 1918, there was noted absence of movement of the right facial muscles and profuse discharge from the ear. Leucocyte count was 42,400; temperature 100° F., pulse 138, respiration 38. A simple mastoid operation was performed. The next day, October 10, 1919, the facial paralysis was the same, but there was swelling of the face about the eyes, jaw and neck with crepitation. The neck was rigid, head retracted and Kernig, Brudzinski and Babinski signs positive. Spinal puncture yielded a few drops of turbid fluid, with pus and gram-positive cocci. Death occurred the same day. Final diagnosis: Broncho-pneumonia, right facial paralysis, right otitis media, suspected sinus-thrombosis or rupture of apex of right lung, septic meningitis. Permission for post-mortem could not be secured.

Sinusitis was diagnosed in several of the older children, but no operative interference was necessary.

1920: We are struck at once this year with the large number of cases of middle ear infections, present in 10 per cent. of the series. We had no cases of mastoiditis. Sinusitis was as common as otitis.

CARDIOVASCULAR COMPLICATIONS OF INFLUENZA-PNEUMONIA

1918–1919:

Cyaosis was seen in more cases than the histories indicated—35 cases of the 293. Again it was more marked in the period up to 4 years. In the remaining cases *pallor* not infrequently was striking.

Relative *bradycardia* was noted but four times in the entire series. Thorough examination of the histories failed to reveal the slow pulse, which was so striking in adults.

There were no observations on cardiac dilatation and only one instance of a well-marked *myocarditis*. Acute endocarditis, pericarditis and thrombo-phlebitis did not occur.

1920:

Cyanosis was present in all instances (7) in terminal cases. *Pallor* was not prominent.

Bradycardia was diagnosed twice. There was one case of acute endocarditis and one of pericarditis.

The cardiovascular system exhibited complications more nearly approaching those of normal times in the epidemic of 1920.

GASTRO-INTESTINAL AND ABDOMINAL COMPLICATIONS OF INFLUENZA-PNEUMONIA

1918–1919:

Persistent *vomiting* appeared in two cases. There were no accurate records of the instances of emesis at some time during the course of illness.

Jaundice was seen in one case, in a boy of eight months, with palpable spleen. Icterus appeared on the ninth day, death resulting three days later.

Constipation was the outstanding feature of the gastro-intestinal symptoms and was present in 113 cases, or 38.5 per cent. (16 per

cent. in influenza). As with influenza *colitis* also appeared and in young infants was a serious complication.

Enlargement of the *spleen* was noted five times.

Tympanites was commonly seen. Marked abdominal tenderness was infrequent. There were no cases of appendicitis, subphrenic abscesses, hepatitis or peritonitis.

1920:

Vomiting at the onset or during the course of pneumonia was present in 17 patients (27.8 per cent.). Jaundice was absent.

Constipation was much commoner this year, 31 cases (50.8 per cent.). Colitis and severe gastro-enteritis were not present this year. Diarrhœa was seen but twice. There was a palpable *spleen* in 4 infants in the period up to 2 years.

Tympanites was more frequent in 1920 and was very marked in 6 cases, being associated with tenderness. In one instance, appendicitis was ruled out with difficulty.

The outstanding features of gastro-intestinal complications in 1920 were frequent constipation and absence of severe colitis and enteritis.

NERVOUS COMPLICATIONS OF INFLUENZA-PNEUMONIA

1918–1919:

Convulsions were noted in only seven cases, but these figures are not reliable, as they indicate only those cases observed in the hospital.

Encephalitis and neuritis were not observed during the epidemic. Several months later sporadic cases of encephalitis-lethargica were seen (in all about six).

Meningismus appeared in 18 cases. The diagnosis was verified in most instances by spinal puncture.

In one case of a girl of 4 years there was observed *tetany* with classical carpal and pedal spasms and repeated convulsions. The spinal fluid was negative. Death resulted in 8 days.

Meningitis: In all there were 5 cases—3 streptococcus, 1 pneumococcus, and 1 meningococcus. A synopsis of two of the cases will be given because of their unusualness:

I.—A male infant of twenty-two months was admitted on October 25, 1920. There was a history of irritability, cough and fever. The baby apparently had had pertussis the previous six weeks, but had

developed additional symptoms only two or three days preceding admission. The mother was ill with influenza-pneumonia. Examination showed broncho-pneumonia, with findings most marked in R.L.L. The reflexes were normal. Temperature, 101.4° R. Eight days after admission on November 3, there appeared marked restlessness, strabismus, some cervical rigidity, grating of the teeth, and the Kernig sign was positive. Spinal puncture yielded 2 c.c. of a bloody fluid with intracellular gram-negative diplococci, diagnosed meningococci. Serum was given intravenously and intraspinously, but death resulted in November 6.

Diagnosis.—Pertussis, influenza-broncho-pneumonia, epidemic cerebrospinal meningitis. No post mortem.

II.—A girl of five years was admitted August 21, 1918, with the diagnosis influenza phlyctenular keratitis. Physical examination was otherwise negative. On September 1 she was transferred to the contagious hospital for erysipelas of the right cheek. Temperature, pulse and respiration had been normal until August 31, when they were: temperature 101.6° F., pulse 132, respiration 22. By September 7 she had recovered from the erysipelas and was sent back to the eye department for further treatment. She did well until September 19, when there was sore throat and headache. Cultures were negative for diphtheria. The next day, September 20, she had frequent vomiting and headache. On September 21 there was no headache, but the neck was rigid; Kernig and Brudzinski signs positive, Babinski negative. Spinal fluid was under increased pressure, slightly turbid, 459 cells, lymphocytes 31 per cent., polymorphs 69 per cent. Blood count showed 21,900 W.B.C. There was no paralysis. Antimeningococcus serum was at once given intraspinally and child transferred to Contagious Hospital. Here bacteriological examination of the spinal fluid revealed gram-positive cocci. Death occurred on September 23. No post mortem. Diagnosis: Influenza, phlyctenular keratitis, erysipelas, septic meningitis.

III.—The writer is indebted to Dr. James C. Small of the House Staff for the following case observed just before the epidemic of this year.

A female infant of nine months was admitted on December 7, 1919. She was sent in by the Department of Health with the diagnosis of epidemic meningitis. She was taken ill on December 3, 1919,

with vomiting. There had been no rash, coryza or cough. Temperature, 103.8° F. Examination showed stupor, some rigidity of the neck, fontanelle open, tense, bulging, pulsating 155 per minute. Ears and nose were negative. The eyes were both deviated to the left, the right slightly more than the left; pupils equal, reacting poorly to light; no ptosis or nystagmus. There was some cervical opisthotonus and pain on passive motion of the neck. The arms were flexed at the elbows and the fists clenched; slight spasticity but no tremor was noted. Lungs were negative. The heart had a systolic murmur over the apex, which was not transmitted. The liver was just palpable, but not the spleen. No abdominal tenderness was present. There was no paralysis of the lower extremities.

Reflexes:	Right	Left
Pupillary	—	—
Extensors of wrist	—	—
Abdominal	0	0
Patellar	—	—
Achilles	—	—
Babinski	0	—
Gordon	0	—
Oppenheim	0	—
Kernig	—	—
Brudzinski	—	—

There were no sensory disturbances or hyperæsthesia, and the skin was clear. Spinal puncture was done with the following results:

Eighteen cubic centimetres turbid fluid, slightly increased pressure, 1400 cells, 80 per cent. polymorphs. B. influenzæ in smears (gram-negative bacillus). The organism was cultivated and positively identified (on brown blood agar).

Antimeningococcus serum was given the first day. On the third day Doctor Small, who was convalescing from influenza, gave some of his blood—10 c.c. of this convalescent serum was injected intraspinally and 5 c.c. intravenously. There was no decided improvement. Repeated spinal punctures became more difficult as the fluid contained a large amount of fibrin. Phagocytosis was active as evidenced by the presence of from a few to 15 bacilli in the leucocytes. Cheyne-Stokes respiration was noted on the third day after admission, and gradually there appeared muscular twitchings, internal strabismus, increasing opisthotonus, and spasticity of the extremities. On December 17 and 19 intraventricular punctures were made with the

removal of 35 and 25 c.c. of the same character as the spinal fluid. There was then some slight improvement. However, broncho-pneumonia was diagnosed on December 20 and death occurred on the same day.

1920:

Convulsions were common in infants—9 cases in the period to 4 years.

Meningismus appeared in 6 children, but there were no cases of meningitis or encephalitis.

The conclusion is that the nervous system suffered much less in the present year.

GENITO-URINARY COMPLICATIONS OF INFLUENZA-PNEUMONIA

1918–1919:

Simple nephritis was observed in two children of the 6- to 7-year group. There were numerous instances, however, in which there were traces of albumin in the urine with a few hyaline casts.

Pyelitis and cystitis were not seen.

1920:

There were no genito-urinary complications.

MISCELLANEOUS COMPLICATIONS OF INFLUENZA-PNEUMONIA

1918–1919:

Cervical emphysema of undetermined etiology was seen in one case, previously mentioned.

Rashes of the toxic erythema types were recorded in 6 cases. There was one case of scarlet fever and one of herpes zoster.

Arthritis was diagnosed in one case. The history of one case, late in the epidemic, with unusual septic epiphysitis, follows:

H. M., a girl of four years, was admitted to the hospital March 18, 1919. The history was that seven weeks previously she had been ill with influenza; other members of the family were likewise affected, the father dying. Her illness was of one week's duration, with chills; temperature 104° and slight cough. She had not been well since then. Three weeks before admission there appeared swelling of the left hip region and thigh, which was persistent and painful. Examination at the hospital showed a pale, emaciated, anæmic female with distressing cough and dry, scaly skin. The ears, nose and eyes were

negative, and the mouth exhibited a low-grade stomatitis. There was impaired resonance over the left lumbar and right lumbar lobes, with crepitant and subcrepitant râles and patchy tubular breathing. The heart was negative, also the abdomen, except for palpable liver. There was a moderate general adenopathy.

Limbs.—The left leg was 2 cm. shorter than the right with apparent angular deformity of the upper third of the femur. A large, tender, fluctuating mass surrounded the hip-joint and upper femur. The lower leg was œdematous. White blood-corpuscles, 13,600. Three cubic centimetres of thick green pus was aspirated from the swelling and diplo- and streptococci demonstrated. Tubercle bacilli absent.

X-ray examination showed a *separation of the epiphysis of the head of the left femur, with dislocation of the head of the femur.* There was no evidence of bone pathology or fracture.

X-ray examination of the chest revealed a left-sided thickened pleura or encysted effusion (aspiration yielded pus). Von Pirquet was negative. Highest temperature was 101.2°. On March 26, Doctor Meyer operated upon the child, under local anæsthesia, because of child's poor condition. Lateral and posterior incisions were made into the hip-joint, the head of the femur removed, and drainage tubes inserted. Death occurred three days later, March 29, 1919. (See Photograph.)

1920:

There was one case of toxic erythema in an infant of eight months. A severe cervical and axillary adenitis was present in a boy of three years, who died with evidence of laryngeal obstruction. A large mass seemed to compress the anterior pharynx backward. Post-mortem examination could not be secured, so that the findings could not be checked.

AFTER EFFECTS

Pulmonary Tuberculosis.—Following the epidemic of 1918–1919, it was expected that in the ensuing year a large number of cases of pulmonary tuberculosis would be admitted to the hospital. In the early months after the epidemic there was a great deal of difficulty in differentiating the post-influenza pneumonia cases, the unresolved pneumonias, and the cases with few findings but persistent temperature, from the cases of incipient or low-grade chronic pulmonary tuberculosis. The Von Pirquet reaction and radiographic studies were of

Œdema and deformity of left leg due to separation of epiphysis and dislocation of head of femur

little assistance, and the variety of physical findings in the lungs were difficult of classification. In the majority of instances the Von Pirquet was negative and in many the X-ray showed a general persistent increase of pulmonary markings and hilum findings, or hazy shadows. As for physical findings there was no marked localization in apices or bases. Irregularly scattered over the chest were areas of impaired resonance, with and without fine moist râles. At times examination spoke for fluid in the chest, but thorocentesis was negative and radiography ruled out pleural effusion.

A clearer understanding of the situation was secured through the studies of the cases that came to autopsy. The characteristic findings were: the presence of a large amount of fluid in the lungs with very little definite consolidation and well-marked enlargement of the thoracic lymph-glands. The striking feature was the absence of tuberculous lesions. The presence of the fluid in the lungs helped to explain the haziness of the X-ray shadows and the hilum increase was the result of the lymph-gland hyperplasia.

With this knowledge of the pathology as a working basis, the subsequent cases were diagnosed with special reference to the clinical findings. If the frequency of miliary tuberculosis and tuberculous meningitis has any relation to the incidence of tuberculosis in children, then it may be said that the hospital records prove that a smaller number of cases of tuberculosis than usual has been seen in the last year. At the present time it is the opinion of the Attending and Resident Staff that there has been no increase in the incidence of pulmonary tuberculosis in children.

Persistent Vomiting.—A gastro-intestinal complication that was not noteworthy last year but is striking at the present time is post-epidemic persistent vomiting. In the second week following the acute period of the 1920 epidemic, several children (about a dozen) were admitted to the Children's Hospital with a history of severe and repeated emesis, the history being very much the same. A few days after the subsidence of the attack of influenza, the children began to vomit, for some unexplained reason, and the emesis persisted for four or five days in spite of all treatment. When seen at the hospital they were acidotic, most had a leucocytosis, and physical findings were negative. Shortly after admission the vomiting ceased abruptly. There were no fatalities.

tated oviduct and in an adenomyoma of the uterus have been reported. Only four cases occurred in the colored race in a series of 189.

Ectopic gestation begins most frequently in the oviducts and generally terminates during the eighth week, either by rupture or by abortion.

Some authors believe that infantile tubes constitute one of the most prolific etiologic factors in tubal pregnancies. The accepted teaching to-day is that conception takes place either on the surface of the ovary or immediately after the escape of the ovum from the Graafian follicle, the fecundated egg then making its way into one or the other Fallopian tube by internal or external migration. (N.B.—*Internal migration,* the impregnated ovum passes through the tube, across the fundus, into the other tube. *External migration,* the impregnated ovum passes behind the uterus into the opposite tube.) Usually, therefore, conception occurs near the ovary (ampullar), hence in a region which is the site of much gynæcologic pathology (ovarian diseases, tumors, pyosalpinx, etc.). An ovum may, however, become fertilized and be arrested at any point of its passage from the ovary to the uterus and still continue to develop.

The most common localities of ectopic gestation, in the order given, are as follows:

1. *The tube*—the median, isthmial, ampulary, uterine and interstitial portions.

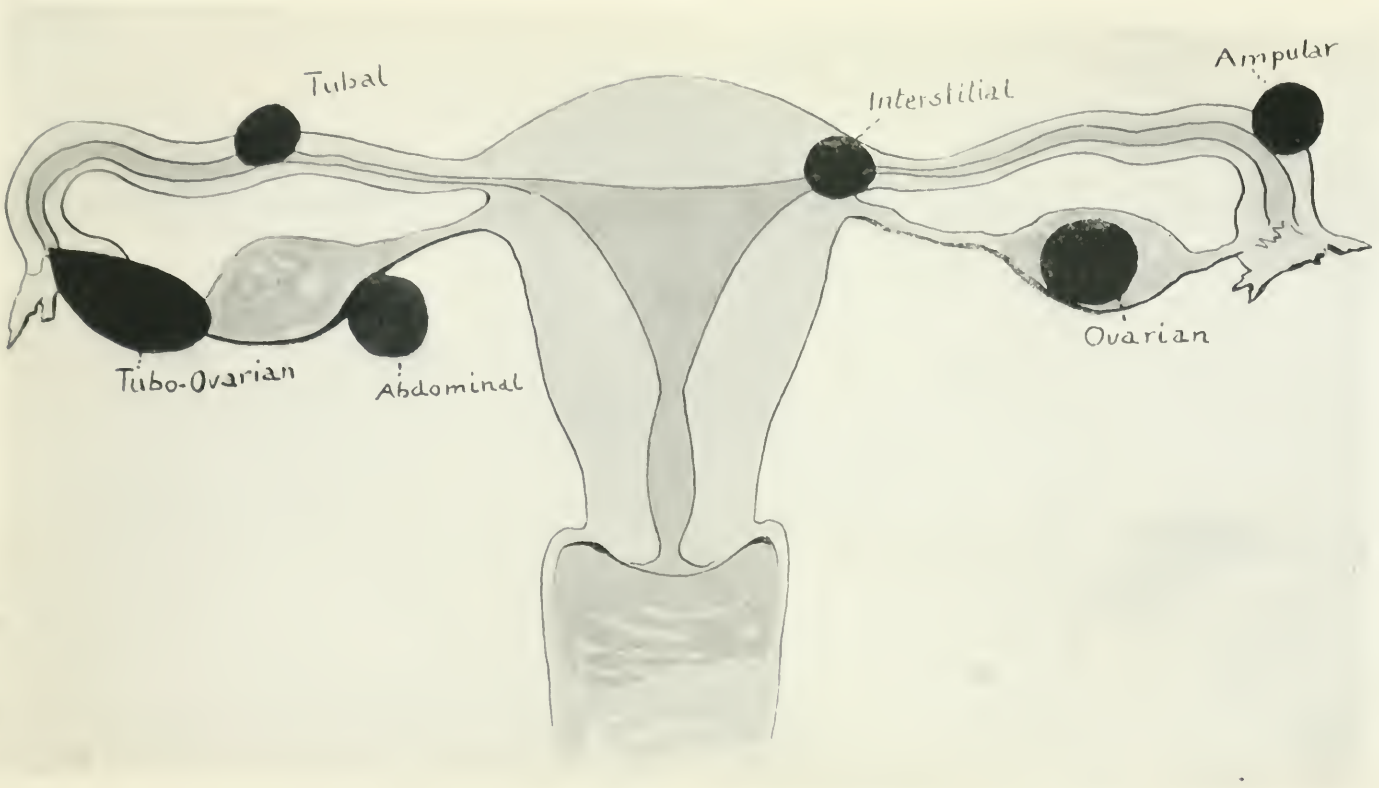
2. *The ovary* (see Fig. 1).

Primary abdominal pregnancy has been reported on the posterior fold of the broad ligament and on the omentum, but it is exceedingly rare.

Secondary abdominal pregnancy is common, as reported by Hecker; but in these cases impregnation occurs in a sinus, possibly within a piece of a Fallopian tube following vaginal hysterectomy, or in a stump of a tube after partial salpingectomy. It may occur in a closed accessory horn of the uterus, or on the fimbria ovarica of the oviduct.

During the course of growth at such abnormal sites, the ovum distends its containers, encroaches upon the adjacent structures and causes inflammatory reactions which are followed by adhesions—thus changing the entire topography of gestation.

FIG. 1.



Showing the most common sites of ectopic gestation.

When the tubal wall ruptures and the fœtus escapes into the abdominal cavity or into a mass of preformed adhesions, we speak of this as a "tubo-abdominal pregnancy." If, in an interstitial pregnancy, the rupture occurs into the uterine cavity, it is called "tubo-uterine pregnancy," but this is rare.

If the ovarian pregnancy goes on toward term, it usually becomes "ovario-abdominal," but all these are secondary forms and are clinically and anatomically difficult to distinguish one from the other.

Eccyesis also occurs in the lower animals and has been noted in the ape, the bitch, the cow, the sheep, and the hare.

Many cases of tubal abortion, or even rupture, are undoubtedly followed by spontaneous recovery, and often pass under the diagnosis of appendicitis, abdominal colic, etc. The "prostitutes colic" is often of this nature.

Ectopic gestation is more common in city than in country practice, after the thirtieth year, after a long period of relative sterility, and in women who have had antecedent pelvic diseases.

The *pathology* includes changes in the ovum, the fœtus and the uterus. The gestation-sac is formed from the coats of the tubal wall. The muscular tissue, instead of undergoing hypertrophy, often tends to disappear. The sac then eventually consists of connective tissue. Mild peritonitis often coexists, and adhesions usually form. The attachment of the ovum is similar to that of uterine pregnancy; a placenta forms, but the decidual structures are rudimentary and the chorionic villi penetrate readily into the gestational sac as far as the peritoneum, thus favoring hemorrhage and the tendency to bring about abortion or rupture. The ovum may undergo early death in the tube and form a mole. If the tube ruptures and the ovum is expelled into the abdominal cavity, it usually perishes. In very exceptional cases it may thrive (secondary abdominal pregnancy).

If the fœtus dies after reaching an advanced stage of development, calcification, adipoceration or mummification, etc., takes place. These conditions may remain latent for years and eventually rupture into a contiguous cavity. If the fœtus reaches a viable stage, it usually dies during, or shortly after, extraction. Exceptionally, survival occurs and the child may be well developed.

No pelvic condition gives rise to more diagnostic errors. Before rupture of the tube, or hemorrhage into it, the diagnosis of eccyesis

is seldom made because the tube is as soft as an intestinal loop. Almost always when such diagnosis is made, it is a tubal abortion in progress, hemorrhage, or a tubal mole.

Most patients will give a history of previous pelvic inflammation, gonorrhœal or puerperal, and often of a period of sterility, before the aberrant conception took place. During the early history of such a conception, the diagnosis must decide if the extra-uterine tumor is an ovum or not, and, during the later period, if the ovum is extra- or intra-uterine.

SYMPTOMS AND DIAGNOSIS

Irregularity of menses, going over a few days, scant or profuse flow, unilateral cramp-like pains in the lower abdomen, with irregular uterine hemorrhages, should arouse suspicion of ectopic pregnancy. If sudden, excruciating pelvic pains occur with vertigo, faintness and collapse, the diagnosis is almost certain, and is confirmed by finding an extra-uterine tumor, or the discharge of uterine decidua.

When rupture takes place and a peri-hæmatocele forms, if the hemorrhage be slow, one can trace from day to day the increase in size of the hæmatocele. The examination should be conducted with extreme gentleness, owing to the great danger of sudden rupture with a fatal hemorrhage.

The diagnosis cannot be made on any one symptom, but must depend upon the ensemble of symptoms and history.

The *differential diagnosis* should be made from acute appendicitis, ruptured pelvic abscess, uterine abortion, cysts of the ovary with twisted pedicles, and a rupture of the Graafian follicle in normal menses.

The *history* is of great importance, but in the case of an unmarried woman, who makes heroic efforts to shield her character, a correct history is difficult to obtain.

Signs and symptoms of uterine gestation are usually absent. Occasionally there are no symptoms until pain and collapse occur. The history and local symptoms overshadow all others in 96 per cent. of the cases, says one observer.

Previous childbirths are the rule, and some patients think that they might be pregnant, but few actually believe they are.

Oastler enumerates the symptoms as follows:

Periodical pains of varying degree, located on one or both sides of the pelvis, followed, as a rule, by a bloody discharge.

Bleeding occurs in from four to twenty-one days after the period was due. Missed periods are noted in most cases.

Microscopic examination often shows some decidua.

The cervix is soft and the os patulous. The uterus is slightly enlarged. Increased pulsation in the vaginal vessels of the affected side is frequently observed. Tenderness over the site of the lesion was found by one writer in all of his 106 cases, and out of proportion to the rigidity and distension of the abdomen. The uterus was seldom found drawn backward, on account of the tubal pregnancy alone, as in a disease of an inflammatory nature. The cervix is strikingly pale, as compared with the mucous membrane of the vagina. There is turgescence of the external genitals. Rectal tenesmus is frequently present. Traction on the cervix usually causes great pain in tubal pregnancy.

Breast symptoms are present in about 50 per cent. of the cases. Temperature is moderately elevated in most cases. The pulse-rate may not increase for three or more hours after rupture. Emesis and faintness occur in many of the severe cases. Collapse is observed in 25 per cent. to 35 per cent. of the severe cases; the shock is not due entirely to the amount of hemorrhage. Leukocytosis is high following severe hemorrhage into the peritoneal cavity.

All of Oastler's 106 cases had hemorrhage; 88 had pain; the average temperature was 98.8° F. in the morning and 101.1° F. in the evening. The bleeding was generally associated with pain, and leukocytosis was found in a large percentage of his cases. Excluding infected cases, he found an average leukocytosis of 14,430 with a polynuclear count of 83 per cent.

Internal hemorrhage occurs in every case of interrupted tubal pregnancy, and there may be bleeding from the tube without rupture or abortion. One writer found that 64 out of 117 cases had tubal abortion; the blood and contents of the tube were expelled from the fimbriated end into the abdomen.

Restlessness is pathognomonic of internal hemorrhage.

During the first three months of tubal pregnancy the uterus undergoes hypertrophy, and its endometrium becomes converted into a decidua similar to that of a uterine pregnancy. Soon after the death

of the fœtus, the decidua is thrown off, being expelled in shreds or in a triangular endometrial cast of a hypertrophied uterus. And according to Remy, this is always a sign of extra-uterine pregnancy.

When the tubal gestation ends previous to the eighth week, be it due to ovular apoplexy, tubal rupture or tubal abortion, the ovum is absorbed.

The collateral changes in the uterus during eccyesis are interesting, as they are, to a certain point, the same as those in normal pregnancy —even to the formation of a decidua vera. The decidua is usually thrown off at an early period in bits or *en masse*. Exceptionally, they are retained to term when so-called false labor occurs.

TREATMENT

There is no medical treatment, nor even any palliative therapy, for the right of the child to be born alive does not enter into the question.

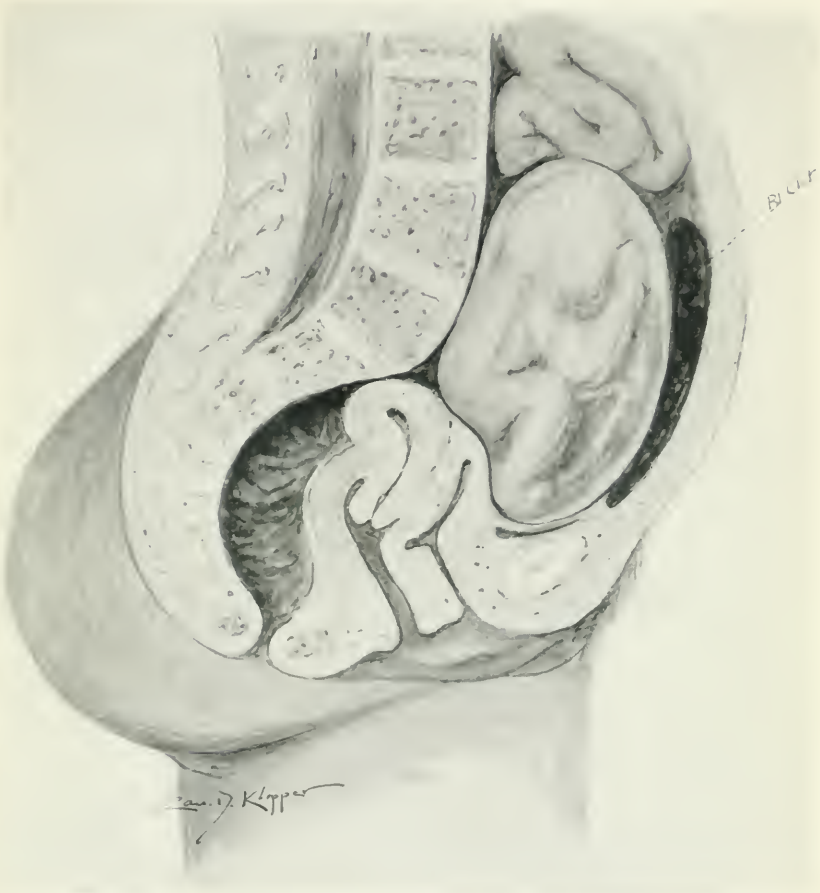
During the early quiescent period when the condition is strongly suspected, the tube should be extirpated. The ovary may be left undisturbed, or treated according to indications.

After the diagnosis of rupture or abortion is made, a radical operation is at once obligatory, as the patient is in imminent danger of death.

When the loss of blood has been profuse, or is still taking place, saline infusion (intravenous) should be begun simultaneously with, and be continued during, and after, the laparotomy until physiologic effects are obtained. On the other hand, it must be remembered that after rupture of the sac, a hæmatocele often forms, which, if not infected, may be left alone to eventually be absorbed, or drained through the posterior vaginal cul-de-sac of Douglas.

If pregnancy has advanced beyond the fourth month, the fœtus being considerable in size, the adhesion of the sac to the adjacent viscera being firm and extensive, and the vascular connections of the sac, especially in the placental region, being much greater, the operation becomes more formidable. Hence, it is better to operate as early as possible, before the child becomes viable. Exceptionally, or through religious scruples, the patient may demand delay to save the child: in this event the expectant mother should be hospitalized for obvious reasons.

Fig. 2.



Showing large, flat blood clot lying anterior to gestational sac: and, the position of fœtus as if sitting on the fundus of the uterus with its feet resting anterior to bladder.

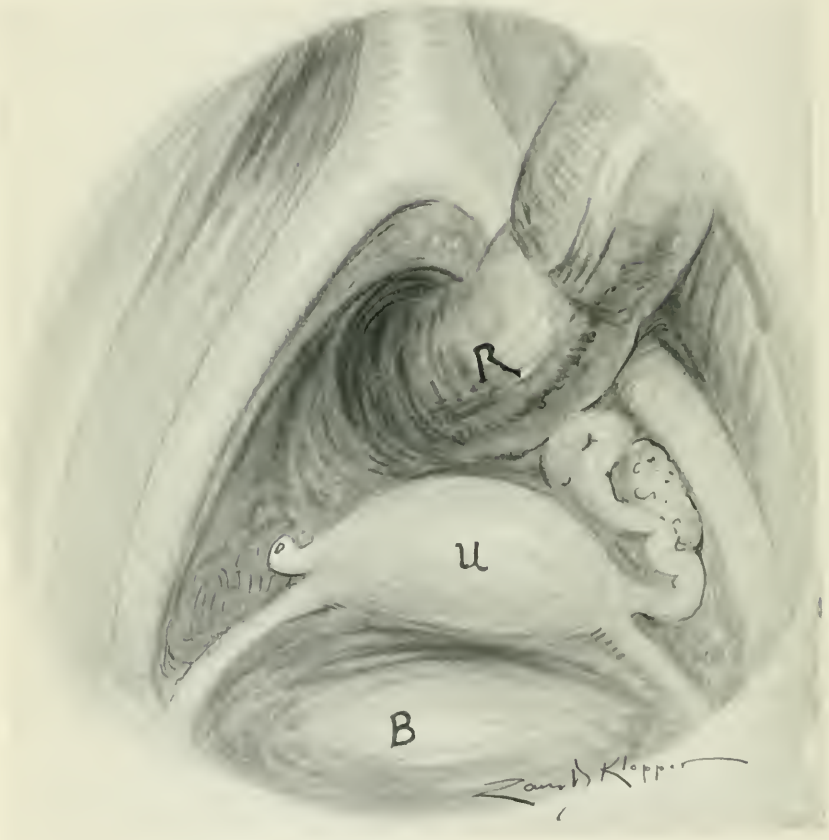
Fig. 3.

Showing the large area occupied by pan-cake shaped clot; the adhesions of gestational sac to intestines, omentum, anterior and lateral abdominal parietes, thus preventing contamination of free peritoneal cavity.

Fig. 1.

Showing the right leg of the fœtus enveloped in the detached right fallopian tube of the mother.

Fig. 5.



Showing stump of right oviduct and absence of right ovary.

CASE REPORT

Mrs. E. B., thirty; colored; born in Chicago.

Family History.—Father died at seventy-two of cerebral hemorrhage after suffering for years of valvular heart disease. Mother living and well, though she was operated on for uterine fibroids.

Personal History—Patient was born with the aid of forceps (after prolonged labor) which injured her eyes, causing permanent impairment of her sight; was well up to the age of twelve when she became weak, thin and nervous and had fainting spells. Puberty at fifteen, but menstruated only once, then not again until she was eighteen. Had dysmenorrhœa, for which many physicians were consulted without avail. Between eighteen and nineteen her menses became established with some degree of regularity, but the dysmenorrhœa persisted. At twenty she married, and nine months later her first child was born. Gestation was normal; labor was prolonged and culminated in instrumental delivery with lacerated perineum. Perineorrhaphy was done some weeks later. Pain and weakness in the right groin were persistent ever since this labor.

In 1913 she was again operated for chronic appendicitis, when a cystic right ovary was removed. Recovery uneventful.

In January, 1917, she became pregnant and suffered excruciating pains in the right side from the beginning. Menstruation occurred in January and again during the last three weeks of February; besides these two periods, there were occasional bloody discharges, but not of any consequence. In March she had symptoms of internal hemorrhage, and again in June (30th), when she became totally blind for about twenty minutes—a state of collapse with extreme symptoms. A relative recovery followed. Not until July 7th was the relief undertaken; this unusual and apparently unpardonable delay occurred because of disagreements between the writer and consultants. (Patient had been in two hospitals and examined by twelve doctors.)

The last consultant, Dr. W. A. Newman Dorland, was the only one who agreed with the diagnosis and the proposed surgical treatment; all the rest stated frankly that the patient was pregnant normally and was malingering in order to have an abortion performed.

On July 7th, in the Deaconess Hospital, the writer, assisted by Doctor Dorland, undertook the surgical relief of the patient. A me-

dian incision, excising the old scar, was made, and revealed a blood clot, large and flat, about 9 inches in diameter and from one-half to one and one-half inches thick. This pancake-like clot lay anterior to what appeared to be a pregnant uterus (Fig. 2). The removal of this clot was followed by collapse. After resuscitation, a careful survey of the operative field proved this mass to be the gestational sac which was adherent to bowels, omentum, anterior and lateral abdominal walls, bladder and uterus; completely segregating the bed of this large clot, thus preventing any contamination of the free abdominal cavity (Fig. 3). The sac containing a five to five and one-half months' old dead fœtus lay in front of the uterus and bladder; the child appeared as if sitting on the fundus of the uterus with its feet resting anterior to the bladder (Fig. 2). An additional freak was discovered: the right leg of the child was enveloped in the detached right Fallopian tube of the mother, the fimbriæ extending one-half to three-quarters of an inch beyond the foot, and the uterine end a little higher than the knee (Fig. 4). The embryonic mechanism of this condition constitutes an interesting problem. No doubt, post-operative adhesions caused the right tube to be drawn in a position anterior to the uterus. Fig. 5 shows absence of right ovary and the stump of the right tube, as was disclosed by the removal of the gestational mass.

There were so many ominous viscero-intestinal adhesions found that a secondary operation was decided upon. Owing to the patient's weakness, nothing was done that was not absolutely indicated at this time. Salines and cautious post-operative treatment were prescribed. Patient left hospital in three weeks.

September 5th, at St. Mary's Hospital, the vicious adhesions were severed, Doctor Dorland again assisting. After four weeks the patient left the hospital, is healthy and strong and has worked hard ever since.

The points of interest in this case are:

1. The location of the gestation-sac in front of the uterus and the bladder. A careful study of the literature would seem to prove this to be the only case of the kind on record.

2. The freakish envelop of the right leg of fœtus—the detached right Fallopian tube of mother extending from a little above the knee to one-half to three-fourths of an inch beyond the foot.

3. The patient continued to secrete a rich creamy milk in both breasts ever since the birth of her child eleven years ago, without any subsequent pregnancy, excepting the one here described.

4. The patient belongs to the colored race, in which ectopic pregnancy is rare; there are only four cases reported in a series of 189 in the literature of one observer.

5. Her right leg was swollen from the toes up to the hip after both operations, followed by complete recovery.

6. Conception in the *right* tube, though the right ovary had been removed, thus supporting one of the theories advanced.

The lesson is: More cautious study of women and their ailments, not to stigmatize them as hysterics, malingerers or abortionists, because the diagnosis cannot be readily made. There were eleven competent physicians insisting that this patient had criminal intentions. No doubt, the absence of a mass in Douglas' cul-de-sac was the complicating feature in the diagnosis.

My primary object in writing this paper was to drive home the principle I have been teaching for years, *i.e.*, more charitable, more scientific and more conscientious study of woman in her physiological discomforts as well as in her pathological conditions. Surely, she has a right to demand this much from the medical profession.

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Medicine

THE SKIN LESIONS OF SYPHILIS

WITH SPECIAL REFERENCE TO THEIR DIFFERENTIAL DIAGNOSIS

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INTRODUCTION

The skin lesions of syphilis, although not the most important, are the most striking manifestations of the disease, and are the ones which, next to the chancre, most frequently first lead the patient to the physician. That great significance was attached to these phenomena by the early syphilologists, and by the laity of the times as well, is attested to by the term "the big pox," which term is still applied by certain individuals.

It is not surprising that lesions which exhibit so many and diverse forms as the cutaneous manifestations of syphilis should present difficulties of description and classification, and while the all-important point for consideration of a pathological cutaneous condition is, whether or not it is syphilis, it is most desirable for purposes of description to classify the lesion.

The term *syphilide* has most frequently been employed to designate the cutaneous manifestations of this disease, but it would seem that upon etymological grounds the term *syphiloderm* is more correct.

HISTORICAL

As early as 1497 Leoniceno [1] recognized the skin lesions of syphilis and distinguished them in accordance with the humoral theories of the times as bilious, melancholic, etc., and a year later Gaspard Torella [2] classified them as moist and dry pustules. Fracastoro,[3] in his immortal poem wrote of "pustules and conical pimples," while Haffenreffer,[4] in the middle of the seventeenth century, described spots, dry and moist pimples, crusts and ulcers.

The great John Hunter,[5] who did so much to retard the knowledge of syphilis by his experiment upon himself and his

false interpretation of it, added nothing to the understanding of the syphilodermata.

Passing on to more modern times we find Lancereaux [6] describing in his "Traité de la Syphilis," published in 1864, practically all of the varieties of the skin lesions of syphilis which are recognized to-day.

CLASSIFICATION

Nearly all modern syphilographers describe the syphilodermata as occurring in the various classical forms of skin eruption; macules, papules, vesicles, pustules, tubercles, etc., while each one divides the forms into sub-classes, according to his own observation. The following classification, while perhaps open to some objections, seems to me to include all the known varieties of the skin manifestations of syphilis:

I. Macular:
- (*a*) Roseolar.
- (*b*) Annular.
- (*c*) Pigmentary:
  - (1) Spots or patches.
  - (2) Retiform.
  - (3) Marmoraceous.

II. Papular:
- (*a*) Miliary or follicular.
- (*b*) Lenticular or flat:
  - (1) Ordinary.
  - (2) Nummular.
  - (3) Annular or circinate.
  - (4) Papulosquamous.
  - (5) Moist papular or condyloma lata.
  - (6) Vegetative.

III. Vesicular (rare).

IV. Bullous (rare).

V. Pustular:
- (*a*) Acuminate:
  - (1) Small.
  - (2) Large.
- (*b*) Flat:
  - (1) Small.
  - (2) Large:
    - *i*. Superficial.
    - *ii*. Deep.

VI. Nodular or Tubercular.

VII. Gummatous.

While the above classification covers the general characteristics of the syphilodermata, it is not unusual to find two or more varieties in the same individual. Thus a maculopapular syphiloderm or a papulopustular syphiloderm frequently is observed.

PATHOLOGY

The gross pathology of the cutaneous lesions of syphilis, which, as will be seen, are many and varied, and which occur at varying periods following infection, may be considered more in the light of symptomatology than pathology and will be fully described under the appropriate headings. The histopathological picture of these lesions, while presenting many interesting features, is not nearly as striking as their gross appearance. In general, it may be said of the syphilodermata that they truly represent the reaction of the tissue to the invasion of the *spirochætæ* and show various combinations of exudation and repair. There is more or less infiltration of lymphocytes and plasma cells, and endarteritis and some giant cell formation, while spirochætæ are found more or less plentifully, particularly in the earlier types of lesions.

DESCRIPTION

Macular Syphiloderm.—The most frequent form of the macular syphiloderm is the *roseolar,* which is also the most common of all the skin manifestations of syphilis. This usually is observed six to seven weeks following the appearance of the chancre, although the time may be shorter or considerably longer. This eruption also may be observed as a recurrence as long as several years after the chancre.

The roseolar syphiloderm in the majority of cases begins on the upper abdomen, spreads to the thorax and later may involve nearly the entire surface of the body. The dorsal surfaces of the hands and feet usually escape. Occasionally the eruption begins on the face, being most prominent about the nose, mouth, chin and, especially, the forehead. This syphiloderm consists of variously sized spots, which usually are on a level with the surrounding skin, but may be slightly elevated. The average size is about 1 centimetre in diameter, although they may be considerably smaller and occasionally become much larger. The shape is round or oval with distinct or irregular outline. At first the color is a pale pink or reddish-violet, which dis-

Fig. 1

Fig. 2.

Macular roseolar syphiloderm.

Maculo-papular syphiloderm.

Fig. 3.

Macular, pigmentary, syphiloderm.

Fig. 4

Miliary papular syphiloderm.

Fig. 5.

Miliary papular syphiloderm. (These were practically the only lesions present on the entire body.)

Fig. 6.

Miliary papular syphiloderm, markedly resembling the early lesions of small-pox.

Fig. 7

Same case as Fig. 6.

appears on pressure, but later assumes a dark red, coppery tinge, often described as resembling the color of lean ham. The development of the roseolar eruption may be very sudden, sometimes being brought out by violent exertion or occasionally by a hot bath. On the other hand, its development may be very insidious, requiring a week or more after its appearance to reach its maximum.

Often the spots are faint in color and escape notice until the surface of the body is exposed, as for the purpose of physical examination. The number of the lesions varies from a few scattered spots to a profuse crowded condition, which occupies the greater portion of the cutaneous surface, leaving a comparatively small area of normal skin between the macules. Rarely coalescence takes place. The eruption usually persists for several weeks and may disappear quickly or gradually. Ordinarily there is little or no desquamation, although with palmar lesions this is not infrequent.

Microscopically this type of lesion shows a mild reaction. The epidermis is either unchanged or flattened out, showing obliteration of the natural ridges. The papillary layer of the corium is the seat of the most marked change. Here the blood-vessels are found more or less dilated, filled with blood and surrounded by a moderate infiltration of lymphocytes and plasma cells. The endothelium of the vessels presents a more or less swollen condition and in the adventitia of the larger ones are seen round and spindle cells. Sometimes the process extends a little more deeply, and cellular infiltration is seen around the glandular elements. The spirochætæ are found both in the walls of the dilated blood-vessels and distributed among the surrounding cells.

The *annular macular* syphiloderm is rare and is generally seen as a recurrence. It is usually observed rather late in the course of the disease from one to several, even as long as twenty-nine (Von Zeissl)[7] and forty-six (Brauman)[8] years after infection. It is most frequently found on the flexor surfaces of the forearms, buttocks, sacral region, abdomen and thighs, and never observed on the face, as is the *annular papular* syphiloderm.

This eruption, as the name implies, consists of circles and parts of circles, and even, by coalescence, of large polycyclic figures, the largest ones being noted late in the disease. The circles vary in diameter from a centimetre or two to several centimetres.

At first the lesions are of a bright, red color in contradistinction to the roseolar variety, and later assume a yellowish tone. They are, as a rule, few in number. Scaling almost never occurs, although a very fine desquamation has been observed at the time of involution.

The annular macular syphiloderm is usually rebellious to treatment, persisting sometimes from six months to a year, even in spite of vigorous therapy, while there is considerable tendency to recurrence.

Brocq [9] has called attention to an exceedingly rare type of annular syphiloderm which takes on a decided follicular element, which is seen rather late in the course of the disease, usually in the second or third year as a recurrence. One case seen by me in the clinic of Dr. Udo J. Wile occurred as a recurrence some eight or nine months following the chancre.

The *histopathology* of the annular syphiloderm has been thoroughly studied by Unna,[10] who terms it a *neuro-syphilide*. The process is similar to the roseolar eruption in that there are marked changes in the blood-vessels of the papillary layer, but in addition there is a hypertrophy of the collagenous intercellular substance and a sclerosing of the vessel walls. The process also differs from that found in the roseolar eruption in that plasma and giant cells are never found, and mast cells but rarely, although leukocytes are more numerous. The epithelium takes no share in the process, but appears stretched and atrophic.

The *pigmentary* syphiloderm has been the subject of much discussion and its existence as a distinct syphilitic eruption has been questioned. Fox [11] states that it is neither pigmentary nor syphilitic, that the dark reticulum is secondary, and the whitish macules develop first on the site of the former syphilitic lesions. There seems no doubt, however, that aside from the pigmentation of the skin following certain other syphilodermata there occasionally develops an original discoloration of the skin due to syphilis.

According to Taylor,[12] three varieties of the pigmentary syphiloderm are seen which are as follows:

1. Spots or patches of various sizes.

2. More or less diffuse pigmentation, sooner or later becoming the seat of leukodermic change in the shape of small rectiform spots which gradually increase in size.

3. A so-called *marmoraceous pigmentary syphiloderm* formed by an abnormal distribution of the pigment of the skin, some places becoming whiter than normal by the lack of crowding out of pigment and others darker by the abnormal distribution of pigment.

The first type, consisting of spots or patches of rounded or oval form with sometimes irregular edges, varies in color from light to dark brown, the edges of the spots showing the darker color. The intervening skin is usually normal in color but appears whiter, owing to the pigmentation of the spots. The pigmentation may last for months, after which it may slowly fade and disappear. Sometimes areas without pigmentation are left which are termed *secondary* or *pseudoleukoderma* by Taylor. However, as a rule, the skin returns to normal after the disappearance of the pigment.

In the second form of pigmentary syphiloderm described by Taylor, the so-called *lace* or *retiform variety,* which is the most frequent, the sides or back of the neck either slowly or rapidly become discolored, sometimes extending to the shoulders or trunk. The color is described as that of *cafe-au-lait* or yellowish-brown. Gradually whitish spots develop in the pigmented area, beginning as minute specks and in a short time attaining considerable size and presenting a round, oval, linear or irregular shape. The white spots may actually be lighter than the normal skin or they may only appear so by contrast with the pigmented areas. As the white spots increase in size the pigmented areas become smaller and may eventually consist of narrow bands which cause the lesions to have the appearance of lace, the white spots forming the interstices.

The third form, termed *marmoraceous,* on account of its supposed resemblance of some forms of marble, appears slowly and is usually observed on the sides of the neck, though the cervical and scapular regions may be invaded. It is the rarest variety of the pigmentary syphiloderm. Spots of the skin of varying size and shape become white, while the skin between the spots becomes brown. The margins are hazy and indefinite. There is no hyperpigmentation, the change in color seeming to be due to irregular distribution of the normal pigment. After a variable period of time the lesions slowly disappear and the skin is left in a normal condition.

The pigmentary syphilodermata occur at varying periods following the initial lesions, usually, however, from about the sixth month

to the end of the first year. In one case seen by me this manifestation was observed eight months following a chancre of the left labium majus. The pigmentary syphiloderm may be the only syphilitic lesion present, or it may occur in connection with other syphilodermata. It is most frequently seen in females, males being rarely affected in this manner.

In common with the annular macular syphiloderm, the pigmentary lesions are quite resistant to therapy, often persisting for months in spite of strenuous anti-leutic treatment.

In regard to the pathogenesis of this type of syphilitic manifestation, it would seem that the invasion of the skin by spirochætæ might cause a hyperactivity of the epiderminal pigment cells which result in a hyperpigmentation. Later on, when repair begins, there is an absorption of this pigment in certain areas by the chromatophores and possibly a destruction of the pigment by spirochætæ.

Histopathology.—According to Sutton,[13] in the pigmented areas of the pigmentary macular syphiloderm the papillæ are found to be normal in size, and the vessels apparently but little affected. Large numbers of pigment granules are found in the basal layer of the epidermis, and in some instances can be traced well into the prickle layer. Endovascular and perivascular changes are observed in the deep vessels of the corium, though this feature is not marked. In the leukodermatous areas the papillæ are found to be much flattened or totally absent, while there is either a marked reduction of the pigment granules or they are entirely absent. No abnormality is observed in the corium. The changes from the pigmented area to the leukodermatous area are seen to be very gradual.

Papular Syphiloderm.—This variety of syphilitic eruption may follow the macular syphiloderm, the latter merging into the papular variety gradually so that the term *maculopapular* syphiloderm may be applied with perfect propriety. On the other hand, the papular syphiloderm may appear as the first rash of the disease. The time of the appearance of this syphilitic lesion is subject to great variations, it being observed sometimes as early as the second or third month, or as late as several years following the initial lesion, although the average time is between the third and fourth month for the miliary variety and possibly a little later for the lenticular type. One characteristic of the papular syphilodermata is their tendency

Fig. 8.

Lenticular papular (nummular) syphiloderm.

Fig. 9

Annular papular syphiloderm. (The lesions on the face are acne.)

Fig. 10.

Papular syphiloderm, showing tendency to circinate formation

Fig. 11

Papular syphiloderm of arms, showing slight tendency to circinate formation.

Fig. 12.

Palmar syphiloderm.

Fig. 13.

Plantar syphiloderm.

Fig. 14.

Papulosquamous syphiloderm.

to recurrence, and this phenomenon may be noted under one form of another for a number of years. I have recently had under my care a case in which a lenticular papular eruption occurred fifteen years following the chancre.

While the *miliary papular* syphiloderm is of comparatively frequent occurrence, it is not noted as often as the lenticular form. The miliary eruption varies in size from a pinhead to that of a French pea, is usually associated with the hair follicles and is therefore sometimes termed *follicular*. This lesion consists of acuminate or rounded projections, solid and rough to the touch, which, when large, sometimes show a slight umbilication. Frequently early in the course of the development of the miliary papular syphiloderm there is a tendency shown by the large lesions to form minute vesicles at the summit which last only a few days, and upon drying show an epithelial scale. Occasionally also the summit is surrounded by a small pustule. The most frequent location of this syphiloderm is on the face, neck, shoulders, back, arms and thighs. The separate lesions are often closely crowded and tend to form groups in circles or semicircles with 10 to 40 papules in a group, while the intervening skin is normal. This is especially true of the smaller form and in relapses or when the lesion appears late. It is frequently noted that the trunk is the seat of small papules, while at the same time larger papules are found on other portions of the body.

The color of the miliary papular syphiloderm may be at first a pinkish red, but usually is of a dark red or ham color, with perhaps a brownish or reddish tinge. This latter is always the color which develops sooner or later.

Ordinarily this type of syphilitic eruption comes out rapidly, reaching its full development within a few days to one or two weeks. As with the syphilodermata in general, pruritus is rarely present, except in the negro race, where this symptom may be marked.

The course of this lesion tends to be chronic, lasting from a few weeks to several months and perhaps disappearing spontaneously, the color becoming duller and more somber. Under specific therapy the rash usually disappears with great rapidity. A bluish or brownish-red stain may persist for some time, but no scarring is noted, except when the papule has contained a pustule. It is often noted that fresh papules develop scattered among the original lesions.

Histopathology.—The *miliary* papular syphiloderm usually is associated with a hair follicle. Histologically the epidermis is seen to be more or less œdematous and thinned, while there is noted an infiltration of lymphocytes with an occasional plasma cell and fibroblast around the hair papilla and around and below the follicle. The hair sac is dilated and ruptured by the pressure of the cell infiltration. The blood-vessels of the papilla are seen to be dilated, and are surrounded, as well as filled, with cells. At the periphery of the process some of the vessels are filled with blood, others are obliterated by thrombosis and appear like giant cells. Fordyce [14] states that the giant cells which are very constant in the papular syphilodermata are probably vascular in origin rather than due to the fusion of plasma cells. The sebaceous and sweat glands usually are involved, while the latter are frequently the seat of fatty degeneration and are surrounded by lymphocytes and plasma cells. The erectores pilorum are also usually infiltrated with cells. Spirochætæ are found about the basal cells of the hair follicle, also in the spaces between the prickle cells of the rete.

The *lenticular* or *flat* papular syphiloderm is, next to the roseolar syphiloderm, the most frequently noted of the skin lesions of syphilis. The papules are round or oval, flattened, slightly convex, raised from one-half to one millimetre above the surrounding skin, have sharply defined borders, and, as a rule, show marked infiltration, which is easily detected by palpating a lesion between the thumb and forefinger. They vary in size from that of a pea to a lima bean, or larger, although in the beginning they are small and gradually increase in size. When very large this type of syphiloderm is sometimes termed *nummuler,* and is occasionally seen as large as a silver half dollar or larger. The color is a dull brownish red. This syphiloderm is distributed very extensively over the body, but particularly on the forhead, where it constitutes the well-known *Corona Veneris,* the back of the neck, shoulders, scalp, arms, legs, especially the flexor aspects, the trunk, and sometimes the palms of the hands and the soles of the feet. These papules are usually not so abundant as the miliary type and are less frequently found with the other varieties of syphilodermata, although sometimes a few macular and pustular lesions may be seen.

The development of the lenticular papular syphiloderm is usu-

ally slow and often comes in successive "crops." As the papule develops the surface undergoes more or less change, the epidermis becoming red and shiny and later the centre desquamates, the papules gradually becoming flatter and disappearing by resolution. There is usually some brownish or grayish pigmentation left which is very persistent. There is little tendency to grouping and ordinarily none to coalesce. However, a case which has recently come under my care is a striking example of this type of eruption showing coalescence (see Fig. 8). It will be observed that almost the entire face is covered with a continuous dark red eruption, only a few spots of normal skin remaining, while small and large spots cover a large portion of the remaining cutaneous surface.

In certain cases, especially in negroes, there is a tendency to ring formation, the eruption appearing as complete or partial circles, and is given the term *annular* or *circinate* syphiloderm. This condition is brought about, according to Hazen,[15] in a number of different ways and may develop from the miliary lesions as well as from the lenticular. As it probably always develops from one or the other of the papular syphilodermata, it should not be considered as a distinct variety. The papules may be grouped in a circle, the central ones rapidly disappearing and the peripheral ones coalescing more or less and forming the circular lesions. Or the annular lesions may develop from a single papule which first spreads, after which the border becomes slightly raised and absorption takes place either in the centre or more frequently just within the outer rim. Or finally a number of papules may form a ring without any lesions in the centre.

Single miliary lesions rarely develop into the annular syphiloderm; the same is true of the smaller lenticular lesions, but the larger ones quite frequently do so. The size of the annular lesion is usually about 1 or 2 centimetres in diameter, although it may be considerably larger. Several may coalesce, forming fantastic patterns, and not infrequently two or more may be concentric. The number varies from one to a hundred or more. The most frequent location of this syphiloderm is on the face, but may be seen on the neck, body or limbs. It may be the only type of lesion present, or may be accompanied by others.

The lenticular papular syphiloderm quite frequently shows a tendency to marked desquamation instead of the slight scaling usually

noted, which has led to the term *papulosquamous* syphiloderm. On account of the resemblance of this condition to psoriasis, it has erroneously been designated *syphilitic psoriasis*. The papules at first usually become slightly less elevated and an accumulation of epidermic scales takes place. This scaling may be very slight and the scales thin and wrinkled, or it may be very marked, the scales being dry, or a dirty grayish or brownish color, thick and usually friable. Occasionally they are hard and horny and adherent. When removed the papule is seen beneath, flat and of a dark red color. Pruritus is rare and never marked except in the negro. These papules which appear late in the disease or as recurrences are more likely to exhibit this tendency of desquamation. Also those of certain localities, as on the face, along the eyebrows and chin, and on the palms of the hands and the soles of the feet show a special predisposition to this condition.

While the palms and soles may be the seat of most of the syphilodermata, when they are attacked by the papulosquamous form the terms *palmer* and *plantar* syphiloderm are applied. Although these lesions are papular in character, they present certain peculiarities which account for the special terms. These peculiarities are due to the thickness of the epidermis of these regions and the firm adherence of the dermis to the underlying fascia. The papules are flat with scarcely any elevation above the surrounding surface, although there is distinct infiltration. At first they appear more as macules than as papules, are of a dull red or yellowish-red color and vary in size from that of a pea to the diameter of a silver ten-cent piece. Later the epidermis becomes partially separated, the color being a dirty gray, while beneath the underlying lesion retains the usual red color. The papules usually first develop in the centre of the palms or soles and may extend by creeping, with an elevated border, to the fingers and toes or even to the dorsal surfaces. There is also a tendency to coalesce, the whole surface of the palm or sole being covered by the lesion.

Sometimes the natural folds or furrows of the skin of these regions become the seat of deep cracks or fissures which may become exceedingly painful and refractory.

While this type of eruption is more frequently observed on the palms of the hands, it is sometimes seen on the soles of the feet as well and occasionally on the latter alone. Rarely only one hand or

one foot is attacked. This type of lesion appearing late in the course of the disease is often most resistant to treatment, and even when observed early with other syphilodermata it is usually less amenable to therapy than the concomitant lesions.

Recently Baker [16] reported an unusual case of involvement of the skin of the feet, a syphilitic keratoderma, in which there was a marked hyperkeratosis covering the soles of both feet and extending over the sides and tops of the feet and more or less up the legs. On the sides and backs of the feet the condition was of a verrucous nature, the warts being nearly half an inch thick and varying in size from a five-cent piece to a quarter. The condition, which was rebellious to mercury and iodides yielded to arsphenamin.

When a lenticular papule, instead of desquamating, presents a more or less moist appearance, the term *moist papular* syphiloderm or *condyloma lata* is applied. It seems to me, however, that the latter term should be restricted to the vegetating type, which will be described later. This type of lesion is usually met with early in the disease and may be observed with other types or alone. However, if not treated, it may persist almost indefinitely and has been observed as a recurrence as late as twenty to thirty years following the chancre. The moist papule usually begins as a flattened elevation, circular, and varying in diameter from 2 or 3 millimetres to 1 centimetre. The reason that certain papules develop into the moist type is to be found largely in the location. The thinness of the skin, the apposition of contiguous surfaces, the warmth and the moisture from perspiration all act as contributing factors. The most frequent location of the moist papule is about the anus and genitalia, especially in women. Not infrequently in the latter this eruption may be the only skin lesion developing throughout the entire course of the disease. The corner of the mouth, the nasolabial fold, the axillæ, the skin beneath the breasts, the interdigital spaces and the skin around the umbilicus may be the seat of this lesion.

In 1918 Rytina [17] reported a case of condylomata of the umbilicus which he states is probably unique. Although, from his description of the lesions, the more proper term, as just mentioned, would be moist papules.

As stated, the moist papule begins as a flattened, elevated lesion which, instead of desquamating, becomes soft and the surface presents

a grayish or brownish-gray, easily detached, mucoid pellicle, composed of macerated epidermis. Sometimes large, flat patches are formed by the coalescence of two or more lesions. Not infrequently these papules may become ulcerated. The moist papular syphiloderm, instead of becoming flat, occasionally hypertrophies and becomes warty or papillomatous. Several lesions coalesce and a large cauliflower mass, surrounding the anus or, in the female, the vulva, may develop, and is termed *vegetating* syphiloderm or *condyloma*. These lesions may occur in other localities, as, for example, the nose. They are accompanied by more or less mucoid secretion and unless strict cleanliness is observed a most foul odor develops.

This type of lesion is usually very amenable to treatment, but occasionally it breaks down spontaneously by a process of ulceration. This latter process, however, does not, as a rule, involve the skin upon which the lesions are located, so there is little or no loss of tissue when cicatrization takes place.

Histopathology.—In the lenticular papular syphiloderm the histological picture is quite similar to that found in the miliary papular lesions except that it is more marked. The epidermis shows perakeratosis, œdema and acenthosis, and there usually is an infiltration of polymorphonuclear leukocytes.

While in the early stages of development there is some infiltration of lymphocytes, the papule is mainly due to epithelial hyperplasia. Later the infiltration is marked in the rete, in all layers of the corium and to some extent in the subcutaneous tissues. In some places the cell infiltration is dense and in others disseminated, but is most marked about the blood-vessels, both of the deep and superficial plexuses. Most of the vessels show thickened walls with diminution of the calibre, and some are obliterated. Giant cells are found, but not as frequently as in the miliary papular syphiloderm. The sweat glands usually are surrounded by cell infiltration as well as showing proliferation of the lining cells.

In the *annular papular* syphilodermata the histological picture varies with the lesion from which it develops. According to Hazen,[15] if the lesion develops from the follicular syphiloderm, the histology is in no way different from the parent lesion. If it develops from the lenticular papular lesion, the infiltration around the blood-vessels is not so marked, as seen in the ordinary papules. However, the cells

are chiefly plasma cells, especially in the older parts. In the circular rim both the corium and the rete are markedly thickened and the intrapapillary processes are elongated and marked decrease in the pigment of the basal layer is noted. The blood-vessels and lymphatics of the corium and papillæ are found dilated and marked infiltration, especially in the papillæ, of lymphoid and fixed tissue cells, with a few polymorphonuclear leukocytes and plasma cells, is observed. The rete, especially the basal layer, is infiltrated with the above-mentioned cells. In the central portion of the lesion there is considerable absence of pigment and some plasma-cell infiltration about the blood-vessels. According to Dennie,[18] the spirochætæ are found in the annular papular syphilodermata only among the leukocytes, which fill the spaces between the prickle cells.

In the *squamous papular* syphiloderm the corium is seen thickened and exfoliating, while the rete is thickened and proliferating.

In the *moist papular* lesion the picture is very similar to that observed in the ordinary papular lesion, except that the process may extend deeper. The rete is usually more thickened and more or less hypertrophy and elongation of the papillæ are seen.

The histopathology of the *vegetating syphiloderm* has been described by Dennie[18] as follows: When divided the lesion is seen to consist of two parts, an upper, dense, finely striated portion, about 4 millimetres thick, and a lower, narrowed core. Microscopically, the former shows many slender epithelial fingers, connected above by thin bridges and below penetrating the corium. The fingers consist of marked hyperplasia of epithelial cells, principally prickle cells.

The spaces between the prickle cells in some areas are widened and filled with leukocytes. The cells of the neighboring germinal layer are pushed apart and communicate with the underlying tissue, thus giving a direct path up to the prickle cells. In certain areas round spaces are observed filled with leukocytes. The papillæ of the corium which dovetail with the epithelial projections are divided histologically into two parts. The first, consisting of the upper two-thirds, is characterized by numerous parallel capillaries mostly filled with red blood cells but occasionally one filled with leukocytes. The infiltration here is mainly lymphocytes and plasma cells, except in the top of the papillæ where some leukocytes are noted. Many lymph spaces are seen which are differentiated from the blood-vessels by the

thinner walls and absence of erythrocytes. A rather frail connective tissue is seen between the vessels.

In the lower part of the papillæ is seen a dense infiltration of plasma cells. Below this area the capillaries are seen to be increased, but the larger vessels are not, while the walls do not show much change, although they present a collar of small lymphocytes. The coil glands show a slight periglandular lymphatic infiltration. The spirochætæ are not found in the dense infiltration nor in any place in the corium except in the tips of the intrapapillary masses. Here they are very numerous and many are observed half in the intrapapillary mass and half between the epithelial cells. The organisms are more numerous higher up in the spaces and with the leukocytes they form a network around the epithelial cells and hundreds are seen in one field. Between the prickle cells they are not very numerous but occur in colonies near the papillary cones. They are found only occasionally in other epithelial areas. Dennie states that the spirochætæ probably gain access from the tops of the papillary cones through the interrupted basal layer of the prickle cells and multiply there. Leukocytes apparently do not inhibit their growth, although the lymphocytes and plasma cells do, as the organisms are not found where marked infiltration of these cells exists. This location of the spirochætæ probably accounts for the marked infectivity of this type of lesion as the organisms can by their motility migrate to the outside through the intracellular spaces.

Vesicular Syphiloderm.—Fox [11] flatly denies the existence of a cutaneous lesion in syphilis worthy of the name vesicular. Morrow [19] states that vesicles are sometimes formed on erythematopapular lesions due to the intensity of the inflammatory process, but considers them as an accidental or accessory phenomenon and of limited duration. He therefore does not think that this type of lesion should be elevated to the dignity of a separated class.

On the other hand, Duhring [20] states that while the majority of so-called syphilitic vesicles may more properly be viewed as early pustules, occasionally lesions are observed that present throughout their course characters which entitle them to be termed vesicular. This author states that Bassereau and also Hardy have described these lesions at length and that they are of various size, from pinhead to split-pea, more or less acuminated, disseminated or grouped, flat or

semiglobular with or without umbilication. They always occur within the first year, usually within the first six months and are generally associated with other lesions.

Dennie [18] describes the lesions of one case observed by him as being 1 to 4 millimetres in diameter, sparsely scattered over the back and flanks, elevated considerably above the surrounding cutaneous surface and appearing translucent and tense with fluid as if quite deeply situated.

In quite an extensive observation of syphilitics in Hot Springs I have not seen the vesicular syphiloderm and on questioning a number of physicians who have practiced here, some of them as long as thirty years, I have been unable to learn of a single case in which the diagnosis was undoubted.

The *histopathology* of this lesion, according to Dennie, is built about a hair follicle, and consists of a triangular mass of densely infiltrated lymphocytes and plasma cells, the apex beginning at the hair shaft, slightly below its origin from the skin, and its base below the fat glands. The corium is seen to be pushed out in all directions, leaving the lesion sharply defined. In the infiltrated area are found numerous spaces, probably lymphatics but practically no blood-vessels. Connective tissue fibres, probably of recent origin, are seen near the hair shaft. The cells of the basal area of the hair follicle show a narrow "halo" due to œdema surrounding it. The blood-vessels beyond this and outside the area of infiltration show peri- and end-arteritis with a "collar" of small lymphocytes. Giant cells are not found and the epidermis shows little change. Spirochætæ could not be demonstrated by Levaditi's method.

Bullous Syphiloderm.—This variety of syphilitic lesion is also very rare in the acquired form of the disease and its existence is denied by some authorities. Fox [11] states that it is never seen when the patient is not suffering from iodism, and Morrow [19] says that it cannot be considered as a distinct type, as the lesions which begin as bullæ rapidly undergo a purulent transformation. This probably is usually the case but undoubtedly sometimes bullous lesions develop which do not become pustular. They are, as a rule, developed late in the course of the disease and generally in individuals of markedly lowered vitality. They are discrete, disseminated, round or oval blebs, pea- to walnut-sized and surrounded by a dark red areola.

They either rupture or collapse without rupturing and dry to brownish or greenish crusts. Beneath the crusts are erosions or ulcers which upon healing leave pigmented cicatrices. This type of lesion is usually rather amenable to treatment.

The *histopathology* of the condition has been described by Terebinsky,[21] who states that the bullæ develop originally between the cells of the rete and that their cover consists, not only of the horny layer but also of epithelial cells changed by inflammatory processes and incompletely or imperfectly hornified. In the rete, which forms the lower wall of the cavity, is found more or less acanthosis. Throughout the entire extent of the lesion the stratum granulosum is missing. In some places the cells have undergone considerable degeneration with coagulation necrosis. The whole thickness of the epithelium is richly infiltrated with polymorphonuclear leukocytes, which in some places form quite numerous dense masses of small size. There are also many plasma cells, particularly in the subpapillary and reticular layers, where there is a great deal of infiltration around the vessels.

Pustular Syphiloderm.—This variety of syphilitic lesion may develop from a previous macular or papular eruption, or it may appear as the first skin manifestation of the disease. It is rare to see all of the lesions in any one case of the pustular variety, papules also being observed in greater or lesser profusion. This syphiloderm is most frequently seen in individuals of lower vitality whose general health is not good. It is, however, undoubtedly caused, not by the *spirochæta pallidum* alone, but secondary pyogenic organisms are responsible to a large extent for its development. While it usually appears within the first six or eight months following the chancre, it may be seen, especially as a recurrence, much later in the course of the disease. This variety of syphiloderm is a much less frequently observed lesion than either the macular or papular varieties.

The *acuminate pustular* syphiloderm occurs, as the name implies, as pointed or rounded pustules. The size varies from that of a pinhead (small) to the size of a pea (large). The small-sized eruptions are often referred to as *miliary and the large-sized as acneiform* or *varioliform*. The small size are always and the large size sometimes connected with the hair follicles. When the lesions begin as papules there is usually a pinkish-red to dark red base which may continue

Fig. 15.

Moist papular syphiloderm and condyloma.

Fig. 16.

Papulopustular syphiloderm.

Fig. 17.

Pustular syphiloderm.

Fig. 18

Rupia.

Fig. 19.

Pustulocrustaceous syphiloderm.

as such or be transformed into a part of the pustule. Even the small-sized pustules sometimes show a slight depression of the summit, while this umbilication is more frequently observed in the larger lesions.

Both sizes are usually quite abundant and may be distributed over almost the entire cutaneous surface. There is, however, a tendency to form groups, especially when appearing as recurrences when, as a rule, the eruption is also more scanty. The development of the acuminate pustular syphiloderm is sometimes rapid, but usually is more or less gradual, lasting several weeks, showing little disposition to spontaneous cure. The pustules dry to crusts which fall off and leave a fringe-like exfoliation of epidermis around the base which has been termed the "collaret." In the larger lesions a superficially eroded base is found beneath the crusts when first formed. The small lesions may heal with no trace left behind but a slight pigmentation or they may leave small pits, while the larger lesions occasionally leave atrophic thinning with slight scarring.

The *large* and *small, flat pustular syphilodermata resemble* each other in many respects but in certain other respects they are so markedly different that it is thought best to describe them under separate headings.

The *small, flat, pustular* syphilodermm, often called *impetigoform,* is a rounded or oblong, flattened, pustular eruption, varying in size from 2 or 3 millimetres to 1 centimetre in diameter. It is usually superficially located and rarely is deep. It is found particularly on the hairy parts, the scalp, the pubes, in men on the chin, but is also seen in other localities, as the forehead, nasolabial fold, and rarely on the abdomen or back. The lesion is usually observed as a discrete eruption but irregular grouping sometimes is seen, while in certain localities, especially the scalp, coalescence is not uncommon. The development of the small, flat pustular syphiloderm is usually somewhat rapid and soon dries into a thick, dirty yellow or brownish crust which may or may not be adherent. Beneath the crust, which sometimes does not completely cover the base, is seen a slight ulcerated area, which, upon healing, leaves little scarring, but a pigmented spot may persist for considerable time. As a rule, this type of lesion is readily amenable to treatment, although if very extensive and the ulcerations deep may be difficult to cure.

The *large, flat pustular* syphiloderm is observed as a superficial or as a deep lesion, the latter being seen later in the disease and is rarer. The superficial lesion does not differ materially from the small, flat pustular syphiloderm except in size and in the usual location which is on the lower extremities, neck, inguinal and gluteal regions and rarely on the trunk. These pustules dry to yellowish-brown or brownish crusts, are more or less adherent, and when removed leave an ulcerated base with an infiltrated, dark red border. A crust may reform several times before the process of healing is complete. Occasionally the crusts form so rapidly that the term *pustulocrustaceous* syphiloderm is applied.

The deep-seated, flat, pustular syphiloderm is usually a late manifestation of the disease, but has been noted during the early course in severe or so-called malignant syphilis. In this type of lesion the crust is thicker and a darker color, even a brownish-black, with sometimes a greenish tinge. Upon removal of the crust a punched out ulcerative area is revealed, which is grayish, dark brown or bright red in color and secretes a purulent, bloody fluid which in a short time forms another crust. Or the crust formation may go on without removal of the superficial crust and several layers be formed, one beneath the other, until a laminated shell-like lesion which is termed *rupia* is observed. Sometimes the crust is slightly smaller than the underlying ulcer and has the appearance of having been "cut to fit."

The most frequent location of this type of lesion is on the face, arms, back and shoulders. It may be rather abundant but rarely is profuse. Sometimes two or more lesions may coalesce, forming large crustaceous areas. The healing process is usually slow. The floor of the ulcer clears up and is filled with healthy granulations; however, the crust may persist until complete healing has taken place. A red, depressed scar is left which is surrounded by a coppery areola and persists for a long time. It may later fade to a dead white color. It has been observed that extensive pustular syphilodermata frequently follow severe chancres.

Histopathology.—The microscopic picture of the pustular syphiloderm varies with the extent of the process and is essentially the same as a papular syphiloderm to which is added the changes due to pyogenic organisms. It may or may not be connected with a hair

follicle. It is, however, well defined, is sometimes limited to the corium and sometimes invades the connective tissue. The condition does not vary materially from other non-syphilitic pustular lesions, such as variola. The pus cells are found between the strata of the epidermis, the rete or the corium forming the base, or sometimes the suppuration extends through the latter.

In the *rupial* syphiloderm a marked parakeratosis with infiltration of leukocytes of the entire corium is observed. The crust is formed of aggregations of cells, coagulated serum and detritis.

Nodular Syphiloderm.—This type of syphilitic lesion is, as a rule, a comparatively late manifestation of the disease, but it may develop within the first year when it usually is associated with the papular syphiloderm or the lesion may partake more of a papular nature and the condition is spoken of as *papulonodular*. The true nodular or *tubercular* syphiloderm consists of a firm, circumscribed, more or less elevated lesion, which may involve the whole thickness of the skin. It is of a reddish-brown or copper color and varies in size from a pea to a good-sized hazel nut. The surface is sometimes smooth and glistening or it may be covered by a thin scale of exfoliating epithelium. This type of syphiloderm may develop on any portion of the body, but it is most frequently seen on the head and face, particularly the forehead and nose, also on the back of the neck and shoulders, the extensor surfaces of the joints and the buttocks. It may be generalized or it may occur singly or in groups. Often but six or eight lesions may be present and these confined to a small area. There is a marked tendency for groups of nodular syphilodermata to form circles, arcs, crescents, etc. The coalescence of several nodules may form a *circinate* or *serpiginous* lesion which terms have been applied. The serpiginous lesion tends to advance peripherally, leaving central scarring, though individual nodules are always observed. The development and retrogression of the nodular syphiloderm is usually chronic and as new lesions appear the duration of the condition may be months or even years. The termination is either by absorption, exfoliation, pustulation or ulceration. When absorption takes place a brownish pigmentation is left. When exfoliation is excessive the term *tuberculosquamous* is applied, and if a pustule is developed in the lesion, as rarely occurs, it is called *tuberculopustular*. However, ulceration is the usual termination of the nodu-

lar syphiloderm. The lesion becomes soft in the centre, breaks down and an open ulcer results. This may be superficial or deep and crusting usually occurs. The ulcer has a punched-out appearance with sharp cut edges and is either round or crescentic in shape. The condition may be progressive, either by the extension of a single ulcer, or by the confluence of two or more, and wide areas may be affected. Upon healing there is a more or less irregular reddish cicatrix, which eventually assumes a shining white color and is depressed according to the depth of the lesion. This type of lesion is, as a rule, quite amenable to treatment.

The *histopathology* of the nodular syphiloderm differs but little, except in degree, from that of the papular lesion. With the low powers of the microscope alternate light and dark areas are seen involving the entire cutis from the epidermis to the connective tissue. The high powers reveal the fact that the dark areas are composed of cellular infiltration, while the light areas are made up of blood-vessels. The latter are increased in number and many of them obliterated, their former site being shown by solid cords and giant cells.

Gummatous Syphiloderm.—This variety of syphilitic lesion is usually the latest of the skin manifestations of the disease to develop. As a rule, it does not occur before the third or fourth year following the initial lesion but may be as late as the twentieth, thirtieth or even fortieth year (Morrow). On the other hand, gummata of the skin have been noted within a few months following the chancre.

The essential difference between the gummatous and the nodular syphilodermata is that the former is subdermal in origin while the latter is intradermal. A gummatous syphiloderm first appears as a small nodule beneath the skin, gradually increasing in size, stretching the skin and changing its color to a dull red. The growth may be slow or rapid until the size of a walnut or larger is attained.

At this time it is hard, firm, distinct from the surrounding tissues and freely movable. There are no subjective symptoms, and it may pass unnoticed. It now becomes necrotic and begins to soften in the centre, while it is accompanied by more or less pain and tenderness. Finally the skin over the gumma breaks down and ulceration takes place. The ulcer gradually tends to enlarge, and a comparatively small amount of a yellowish, viscid, gelatinous material escapes. Later on the central necrotic mass or core is expelled, and a circular,

Fig. 20.

Nodular syphiloderm.

Fig. 21.

Nodular (serpiginous) syphiloderm.

Fig. 22

Nodular (serpiginous and ulcerating) syphiloderm

Fig. 23

Gummatous, ulcerating, syphiloderm and scars.

punched-out lesion with indurated dark brown borders results. It varies in depth from 5 to 10 or more millimetres. Rarely there is a tendency to spontaneous healing, though usually this begins as the result of treatment. Healing is by cicatrization and a typical reddish-violet scar results, which gradually becomes colorless and parchment-like with permanently pigmented periphery. In rare instances gummata resolve without ulceration.

If, as often occurs, instead of developing as a circumscribed tumor, the gumma becomes diffuse, a considerable area may be affected from the beginning. The skin over the lesion is at first pinkish, but later becomes a dull red. Ulceration usually takes place in several places, and soon the entire area may be converted into an ulcerating lesion. The edges of the ulcer are usually straight and sharp cut, but may be slightly sloping.

Sometimes gummatous syphilodermata upon ulceration penetrate the underlying structures, and great destruction of tissue follows. On the other hand, the lesion may be comparatively superficial, be small, slow of development, with little or no tendency to ulceration.

While no part of the cutaneous surface of the body is immune to syphilitic gummata the lower extremities are most frequently attacked. Such lesions sometimes appear on the penis and undoubtedly have been mistaken for chancres. (The so-called *chancre redux*). As stated above, this type of lesion shows little tendency to spontaneous healing, but upon treatment usually improvement is prompt.

Histopathology.—The gummatous syphilodermata present extensive vascular change and diffuse infiltration. The walls of the blood-vessels are thickened by an endarteritis, while the calibre is reduced or obliterated. The infiltration consists of lymphocytes, plasma cells and hyperplastic fibroblasts. Areas of caseation occasionally are observed, which contain poorly staining nuclei, fatty droplets, pigmentary granules, disintegrated elastic fibres and colloidal granulations. Giant cells rarely are observed in this type of lesion.

DIAGNOSIS

The skin lesions of syphilis may simulate almost any form of cutaneous disease. There are, however, in the majority of cases certain distinguishing features which enable the clinician to make a

correct diagnosis. The chief of these characteristics of the syphilodermata are the following:

1. Their dark red, ham or coppery color.
2. Their usual freedom from pain or pruritus.
3. Their usual development with little or no fever, but if fever does exist it is usually of a mild type.
4. Their comparatively slow development.
5. Their tendency to polymorphism.
6. Their frequent location on flexor surfaces.
7. Their usual firm consistency.
8. Their tendency to circular arrangement.
9. Their usual symmetrical development.
10. The frequent development of papules.
11. The usual circular formation and small size of the lesions developing early in the course of the disease.
12. The usual white color and non-adherence of the scales.
13. The greenish or black color, the irregularity, thickness and adherence of the crusts.
14. The tendency of the ulcers to kidney or horseshoe shape.

Nevertheless even with these characteristics in mind in some cases the diagnosis on clinical evidence alone cannot be made and recourse to laboratory procedures or even therapeutic tests must be had.

The Roseolar Macular Syphiloderm usually presents little or no difficulty in diagnosis. The chancre is generally still present when this type of lesion is seen and other evidences of syphilis, such as sore throat, lesions of the mouth, falling of the hair, adenitis, etc., are nearly always to be found. The principal conditions from which this syphiloderm must be differentiated are rubeola, rubella, tinea versicolor, scarlet fever, pityriasis rosea, seborrhoic dermatitis and the rashes sometimes following the use of such drugs as belladonna, cubebs, copaiba, opium, sulphonol, antipyrine, etc.

Measles is to be differentiated by its more frequent occurrence in children, its usual more sudden onset with rather high fever, the catarrhal symptoms and bronchitis and the usual more inflammatory and blotchy character of the eruption which is more frequently found on the face and neck than the roseola. Koplik's spots may also be found on the mucous membranes of the mouth. In considering measles in the differential diagnosis it must be forgotten that there

may be a considerable rise in temperature as an accompaniment of the early syphilitic rashes.

In *German measles* the eruption shows no tendency to pigmentation, is of short duration, and accompanied by slight catarrhal symptoms.

Tinea versicolor usually presents little or no difficulty of diagnosis. The rather typical distribution on the trunk and the usual palo yellow or brownish-yellow color of the eruption, as a rule, serves to distinguish it from the roseola. However, occasionally this disease takes on a pinkish or reddish-yellow tinge which renders the differentiation more difficult, although the furfuraceous scaling, the easy removal of the scale *en masse,* the chronic course and finally the demonstration of the *microsporon furfur* will clear up the diagnosis.

In *scarlet fever* the sudden onset with vomiting, the rapid rise in temperature, the bright scarlet eruption beginning on the neck and rapidly spreading to the trunk and limbs, the "strawberry" tongue and pharyngitis and the marked desquamation are usually sufficient to render confusion with the roseola improbable.

Probably *pityriasis rosea* is more frequently mistaken for the roseolar eruption of syphilis than any other condition. This disease, however, nearly always begins with a single large, so-called primitive plaque, usually in the region near the waist-line, from where it spreads over the trunk and perhaps the upper arms and thighs. It is of short duration, usually itches slightly, particularly when the patient perspires, and presents a rather typical, fine, imbricated, branny scaling.

Seborrhoic dermatitis may be mistaken for syphilitic roseola, but it is more frequently seen on the scalp and face than is the roseola; in fact, usually begins on the former, is characterized by a greasy scaling, is more of a yellowish color, has a tendency to spread and, as a rule, causes marked pruritus.

Of the *drug rashes* that following the ingestion of copaiba is probably of the most importance, owing to the frequency of the administration of this drug in gonorrhœa. The drug rashes are, as a rule, of a much more vivid red or scarlet color than the *roseolar syphiloderm,* are of short duration and almost always are accompanied by more or less pruritus.

The Annular Macular Syphiloderm, on account of its rarity, might be mistaken for erythema multiforme, ring worm or pityriasis

rosea. The more sudden onset of *erythema multiforme* and the usual pruritus should serve to differentiate it from the very chronic syphilitic eruption which rarely itches. In syphilis, also, there may be concomitant signs of the disease and usually a positive Wassermann. In *ring worm* the edge of the lesion is more inflammatory than in the annular syphiloderm and the causative organism can usually be demonstrated. The differentiation of *pityriasis rosea* will depend upon the same features as discussed under the diagnosis of the roseolar macular syphiloderm.

The Pigmentary Syphiloderm, in the superpigmentation stage, according to Taylor,[22] is to be differentiated from *cholasma*, and this may usually be accomplished by the history. Later, when the white spots are present, *vitiligo* may be simulated. The location, usually on the sides of the neck, of the syphiloderm and the absence of a distinct brown, narrow margin which is characteristic of vitiligo should serve as a distinguishing feature.

Tinea versicolor may be differentiated by the location, which is rare on the sides of the neck alone, the darker color, the slightly elevated, scaly lesions, the itching and the finding of the causative organism.

The diagnosis of the *miliary papular syphiloderm* is usually quite easily made by the history (perhaps the presence of the chancre) by the color, distribution and grouping of the eruption and by other evidences of syphilis. *Scabies* may be mistaken for this lesion, but should not be so on account of the itching of scabies, the excoriations caused by scratching, and the finding of the *ascarus scabiei*.

Keratosis pilaris may simulate the miliary papular syphiloderm, but may be differentiated by the fact that it is most marked on the thighs, often limited to these regions, is accompanied by pruritus, and shows no tendency to group formations, or to spontaneous healing, and is usually very chronic in its course.

The *early lesions of psoriasis* may appear like this syphiloderm, but are not follicular, are more pronounced on the extensor surfaces of the arms and legs, do not form groups, and are always scaly and never pustular.

Papular eczema should be differentiated by the pruritus, the tendency to confluence, the bright red color, the usual limited distribution and the frequent vesicular formation.

Lichen planus may be mistaken for the miliary papular syphiloderm. The favorite sites of the former eruption are the flexor surfaces of the wrists, forearms and thighs, although rarely it may be generalized. It consists of flattened papular lesions of a polygonal or angular outline, a glistening top with slight central depression or umbilication, with little or no induration and usually marked pruritus. These features, with the peculiar purplish or lilac color and the tendency to confluence, should render the diagnosis easy.

Pityriasis rubra pilaris is sometimes diagnosed as syphilis, but this error should not be made when the tendency of the lesions of this disease to confluence, scaliness and lack of pustulation is considered.

The miliary papular syphiloderm may simulate *acne,* especially when it occurs on the forehead, the so-called *corona veneris.* Acne is essentially of a chronic character, beginning, as a rule, in adolescence and lasting for several years. Also an acne eruption is characterized by its polymorphism, there usually being present comedones, papules, pustules and scar formation, while it presents a much more inflammatory appearance than the similar lesions of syphilis. The dark color and flat surface of the syphilitic lesion should also help to distinguish it from the conical acne pimple.

Lichen scrofulosus, while a very rare disease, may mimic the miliary papular syphiloderm very strikingly. The lesions are, however, of a lighter color, are usually limited to the trunk, are very chronic, and occur almost exclusively in childhood and nearly always other evidence of scrofulous diathesis may be found.

The Lenticular or Flat Papular Syphiloderm, as it most frequently appears, should be easy of diagnosis. The color, the distribution, the symmetrical development and the usual absence of subjective symptoms are characteristic, while other manifestations of syphilis, such as adenitis, syphilomycodermata and alopecia are usually present.

Some of the rarer varieties of this lesion, however, may present more difficulty.

Thus the Annular or Circinate Papular Syphiloderm, in common with the annular macular lesion, may be mistaken for *erythema multiforme* or *tinea circinate* and the same points serve in the differential diagnosis.

This lesion may also be mistaken for *psoriasis,* but the scaling

in the latter disease is more severe, it is seldom seen on the face and never when not found elsewhere, while slight bleeding occurs upon removal of a scale, which does not occur in syphilis.

The Papulosquamous Syphiloderm, owing to its marked resemblance to *psoriasis*, is not infrequently mistaken for that disease and is sometimes erroneously designated *syphilitic psoriasis*. The following table shows the main differential points:

Papulosquamous Syphiloderm	Psoriasis.
1. Location, may be on face, on flexor surfaces, perhaps on palms and soles.	1. Rarely on face or palms and soles. More on extensor surfaces.
2. Scaliness slight or moderately marked.	2. Scaliness very marked.
3. Dull ham or coppery color.	3. Bright or dark inflammatory red color.
4. Scales dirty gray or brownish gray.	4. Scales shining, white and lustrous.
5. Pruritus slight or absent, except in negro.	5. Pruritus rather frequent.
6. History of chancre and concomitant symptoms of syphilis.	6. Not present.

When the papulosquamous syphiloderm is found on the palms and soles the terms *palmar* and *plantar syphiloderm* are applied. When the lesion is limited to the palms it frequently presents considerable difficulty of diagnosis. It may somewhat resemble *psoriasis,* but this disease rarely or never is confined to these regions.

Sometimes it is most difficult to differentiate the palmar syphiloderm from *dry eczema* of the palms. In the latter disease, however, the condition usually is bilateral, the border is poorly defined, is not indurated, the eruption is accompanied by more or less heat and itching, is more frequently located on the fingers and finger ends, possesses no tendency to circular formation and, as a rule, there is a history of a discharge or moisture.

Considerable difficulty may be encountered in differentiating the palmar syphiloderm from *dermatitis seborrhoica,* however, if the points mentioned under the differential diagnosis of this condition and the roseola of syphilis are remembered mistakes should not be made.

The Moist Papular Syphiloderm, the lenticular papular lesion which, instead of desquamating, presents a more or less moist appearance, is usually easy of diagnosis. The history, the location on areas which are kept moist with perspiration, and the usual accompaniment

of other syphilitic manifestations, in the majority of cases will enable the clinician to reach a correct diagnosis.

However, not infrequently the moist papular syphiloderm of the anal region has been mistaken for *hemorrhoids* unless a careful examination of the patient is made. This was most forcibly brought to my attention during my army service. I was summoned to the operating room of the base hospital, in which I was serving, and asked to pass upon the condition of a patient who was on the operating table anæsthetized for a hemorrhoid operation. There were present not only a number of typical moist papules of the anus, but the remains of chancre on the skin of the penis and a typical roseolar eruption on the abdomen, chest and arms.

Veruca acuminata or *venereal* wart sometimes quite closely resembles this lesion, but the syphiloderm usually is as broad at its base as at its summit, while the acuminate lesion is pedunculated. This pedunculated condition may be destroyed by pressure, and in the absence of history and other manifestations of syphilis the diagnosis must rest on laboratory procedures.

The Vegetating Papular Syphiloderm, or true Condyloma, with its typical cauliflower appearance, is scarcely to be mistaken for any other lesion, particularly if other signs of syphilis are looked for as they usually are present.

The Vesicular Syphiloderm undoubtedly is of rare occurrence, however; its rarity should make its diagnosis more important. The appearance of small acuminated, translucent, tense, vesicles on the back or flanks should be looked upon with suspicion. The history of chancre, the presence of other syphilitic manifestations or positive laboratory evidence should make the diagnosis certain.

The diagnosis of the Bullous Syphiloderm, which is also a most rare lesion in acquired syphilis, is to be distinguished from pemphigus and other similar eruptions by the more or less indurated base, the dark red areola and the character of the crusts, as well as the usual presence of other signs of syphilis.

The Pustular Syphilodermata usually present such characteristic appearances that an error in diagnosis should not be made.

The *acuminate* type of this lesion, however, often quite markedly mimics acne or variola.

In *acne* there is never any fever, it is usually seen about the

age of puberty and is confined to certain regions. It has an inflamed, non-indurated base and the suppuration extends deeper than in the syphilitic lesion. Furthermore, this type of syphiloderm usually is accompanied by other manifestations of syphilis.

The resemblance of the acuminate pustular syphiloderm to *variola* is sometimes so striking as to deceive even the most skilled. Not only in the occasional development of the lesions through papules, vesicles, and pustules, but in the occasional presence of high fever and more or less umbilication is the similarity seen. In the majority of cases of syphilis, however, the chancre or other leutic manifestations are present, and the development is slower. The distribution of the syphilitic lesion is, as a rule, general, while the lesions of small-pox are usually more marked on the face, backs of the hands and on the wrists. The lesion of syphilis ordinarily has a firm papular base, while the variola lesion is all pustule. Further, aside from the fever, other systemic symptoms of syphilis are slight, while in small-pox they may be severe.

The Small, Flat, Pustular Syphiloderm must be differentiated from pustular eczema, especially when the lesions are on the scalp or beard and from impetigo. The syphilitic lesion differs from the eczematous lesion in the underlying ulceration, which is not seen in *eczema,* and in the absence of pruritus with which eczema is usually associated.

Impetigo, as a rule, occurs on the face and hands, runs a mild, short course, is not accompanied by ulceration, and is more superficial than the syphiloderm.

The only condition that may be mistaken for the *large, flat, pustular syphiloderm* is *ecthyma.* The syphilitic lesions are generally more numerous and are accompanied by ulceration, while the lesions of ecthyma are more painful, are not surrounded by the coppery red border, and show less tendency to crust formation.

The Rupial Syphiloderm is so characteristic that its diagnosis should present no difficulty.

It is also sometimes necessary to differentiate the pustular syphilodermata from the eruption caused by the administration of *iodin.* As a rule, this can be accomplished without much difficulty by the quicker onset of the iodin eruption, the brighter red color and the softer base. The withdrawal of the iodin will, in the vast

majority of cases, clear up the diagnosis, as an iodin eruption generally disappears when the administration of the drug is stopped.

The diagnosis of the Nodular Syphiloderm is sometimes attended with considerable difficulty. If, however, the history, the color, the tendency to form serpiginous or circinate lesions, the usual ulceration and the pigmentation are considered, errors should be rare.

Lupus vulgaris may resemble the non-ulcerating nodular syphilodermata. Lupus, as a rule, begins in early childhood, and is of very slow progress. The individual lesions of the tuberculous process are soft lesions and compressible, while under a pressure glass they present typical yellowish, semi-transparent points, the so-called *apple-jelly nodules,* which vary from one to four millimetres in diameter and are more or less painful. The nodular syphiloderm when on the face is sometimes diagnosed *lupus erythematosus,* but the border of this condition does not present the individual nodules of the specific infection and there is present a characteristic atrophic scarring in the centre of the lesions not seen in syphilis.

The nodular syphiloderm may be mistaken for *epithelioma,* but this condition usually presents a single lesion, occurs, as a rule, later in life than syphilitic lesions, has an infiltrated, everted border, is slower of progress and is accompanied by glandular enlargements and more or less cachexia. A section of the growth, however, will at once settle the diagnosis.

Acne rosacea may resemble this syphiloderm, but in the former disease the nodules are uneven, usually vividly red, and situated on a reddened, hypertrophied skin. There is no tendency to form serpiginous or circinate lesions, no ulceration occurs and dilated capillaries are generally present.

Leprosy has not infrequently been mistaken for the nodular syphiloderm and *vice versa.* In leprosy there is usually a history of attacks of fever, while the lesions are generally softer, larger, and are found most frequently on the face, ears, back of the hands, and forearms, and areas of anæsthesia among or around the lesion are noted. The syphilitic lesions are, as a rule, accompanied by a history or chancre or other syphilitic manifestations.

The Gummatous Syphiloderm may present some difficulty of diagnosis, especially in the early stages of its development, at which time it may be mistaken for tumors of various kinds, such as fibroid,

lipoma and sarcoma. Later, when softening takes place, a resemblance to abscess, or suppurating gland may be seen. In the ulcerating stage the gummatous syphiloderm must be differentiated from chancre, chancroid, epithelioma, lupus and varicose ulcer.

The lesions of *sporotrichosis* have often been mistaken for gummata both before and after the formation of abscesses, while tuberculous abscesses and ulcers may be confused with this type of syphilitic lesion at some stage in its development. The history in cases of gummatous syphiloderm may be of no value, as quite frequently this lesion develops many years after infection and the original disease is forgotten.

Fibroid is usually more or less pedunculated and the skin over it is normal in color, while gummata are sessile and are covered by a dull reddish skin.

Lipoma is more flattened, less globular, of softer consistency and is less compressible than gumma.

Sarcomata are, as a rule, more generally distributed than gummata and have a predilection for the trunk. The skin over sarcomata is bluish or purplish in color, while the skin over gummata is of a dull red.

With any of the above tumor formations, however, it may be necessary to resort to section of the growth and microscopic examination.

In differentiating gummata from the lesions of sporotrichosis it is well to remember that the latter usually are more numerous than the syphilitic lesions and are not as frequently found on the lower extremities, while they are more rapid of development. After six or eight weeks the lesions of sporotrichosis soften in the centre, forming abscesses which eventually break through the skin forming fistulæ or ulcers, with irregular, violacious undermined borders.

Tuberculous abscesses and *ulcers* nearly always follow tuberculosis of the underlying bones or lymphatic glands. They are of slow development and do not possess the central necrotic mass or core of gummata. Furthermore, they are usually more or less fistulous, of a violaceous color, with soft undermined borders.

A softening gumma may be mistaken for an ordinary *abscess* or *suppurating gland,* as such symptoms as redness, tenderness and swelling with even fluctuation may be present. There is, however, scarcely ever any fever with gumma, or at least a degree or so, and

the leukocytes are, as a rule, normal in number while in abscess and suppurating glands fever and leukocytosis are usually present. Further, an incised gumma will exude only a small amount of seropurulent fluid, while the fluctuation will persist.

Epitheliomata and *lupus vulgaris* may present some difficulty of differentiation from gummata, but if the characteristics of these conditions as mentioned under the diagnosis of the nodular syphiloderm be remembered the clinician should not be led astray.

Not infrequently errors in the differential diagnosis of ulcerating gummatous syphiloderm and varicose ulcers are made. The following table gives the main characteristics of each, which will be seen are quite different:

Gummatous Ulcer.	Varicose Ulcer.
1. Usually on upper part of leg, may be lower.	1. Usually on lower part of leg.
2. Often multiple.	2. Usually single.
3. Circular or polycyclic in outline.	3. Irregular in outline.
4. Edges sharply cut, deep, sometimes undermined.	4. Edges rounded, never undermined.
5. Base granulating or sloughing.	5. Base red, or gray, sometimes diphtheroid.
6. Slight areola, perhaps scars of other ulcers on surrounding skin.	6. Surrounding skin pigmented, thickened and often eczematous.
7. Other evidences of syphilis as scars in other locations.	7. None.
8. Varicose veins usually not present.	8. Varicose veins always present.
9. Wassermann test may be positive.	9. Wassermann test never positive.

Finally, in making a diagnosis of the skin manifestation of syphilis, it must be remembered that nearly any of the skin diseases which simulate the syphilodermata may occur with the latter or in individuals suffering with syphilis but without syphilitic skin lesions. In such cases the diagnosis may be extremely difficult. If, however, the history or the laboratory procedures point to syphilis, specific therapy would be justified, and the healing of the lesions would be very strong presumptive evidence of their syphilitic nature.

TREATMENT

The treatment of the syphilodermata should begin with the chancre. In other words, if all chancres were accurately diagnosed in their incipiency, proper treatment instituted and vigorously carried out, the skin lesions of syphilis would be as rare as smallpox.

This statement serves to pave the way for a most urgent plea for the routine examination with the dark-field condenser by a competent worker of *all venereal sores before treatment, no matter how innocent they may appear.*

If, however, this has not been done and syphilodermata do develop, antiluetic treatment of the most vigorous sort is indicated. Added to this in certain types of lesions local treatment may be of benefit.

No local treatment of the macular syphilodermata is necessary, although in the case of the more resistant annular macular lesion Quinquad used calomel plaster and Leistikow crysarobin and pyrogallic acid locally with success.

Local treatment is not necessary with the majority of the papular eruptions. The palmar and plantar syphilodermata, however, should receive applications of an ointment such as the official unguentum hydrargyri nitratis. I have found bichloride collodion painted on these lesions very satisfactory. The following formula from Lang [23] may be used:

℞

Hydrarg. chlor. corros	0.05–0.2 (gr. ¾ to iij)
Collodii	
Acth. sulph.	āā 10.0 (iiss)
Ol. olivæ	0.2 (iij)

Moist papular lesions and condylomata should be washed once or twice daily with bichloride solution (1 to 4000) or carbolic acid solution (1 per cent.), dusted with aristol, calomel or salicylic acid, and covered with sterile gauze. The application of strong nitric acid followed by a dusting powder sometimes is beneficial.

Pustular syphilodermata may be treated with daily mercurial vaporizations or mercurial baths. The mercurial baths should be prepared by adding 2 to 16 grams (½ to 4 drams) of the bichloride to 30 gallons of warm water and the patient should remain in the bath ten to fifteen minutes. Some absorption of the mercury is likely to occur, so the patient should be watched carefully for symptoms of ptyalism, especially if he is receiving mercury by some other method. The crusts of pustular syphilodermata may be softened with warm boric acid solution and removed. An ointment, such as ammoniated mercury, oleate of mercury (5 to 10 per cent.), unguentum hydrar-

gyrum, or resorcin (5 to 10 per cent.) should be applied on gauze twice daily.

Nodular syphilodermata which have not ulcerated, as a rule, need no local treatment. When, however, ulceration has taken place the methods outlined for the pustular lesions are applicable.

Gummata of the skin seen before ulceration also need no local treatment. It has been suggested that painting these lesions with iodin or the injecting of some mercurial or iodin preparation directly into the gumma or around it will aid in their resolution. These procedures, however, have not been successful in my hands.

Ulcerating gummata of the skin may sometimes be treated successfully by the methods outlined above for treatment of the pustular syphilodermata. These lesions, however, not infrequently are most refractory. In such cases cauterization with silver nitrate or even the actual cautery or the use of a curette may start the healing process. Chronic leg ulcers may be stimulated to healing by "nicking" the entire edge of the ulcer at intervals of 2 to 4 millimetres with a pair of sharp scissors and by means of adhesive plaster strapping the edges back.

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CLINICAL REMARKS ON CHOLECYSTECTOMY IN ACUTE AND CHRONIC CHOLECYSTITIS AND CHOLECYSTO-PANCREATITIS

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For years it was classic to admit that cholecystectomy was not proper in the treatment of acute infectious accidents of biliary lithiasis. In order to discuss this subject it is necessary to completely separate acute suppurating cholecystitis with pericholecystitis from gangrene of the gall-bladder with perforation.

In the case of gangrene of the gall-bladder with perforation, cholecystectomy is imperative and no discussion is possible. In most cases perforation takes place before adhesions have had time to develop and walled off the focus of peritonitis. Infected bile, mixed with pus, flows into the peritoneal cavity. Removal of the gangrenous gall-bladder and free drainage of the abdominal cavity gives some promise of the patient's recovery. But in spite of the operation the prognosis is very serious. Körte (*Archiv für klinische Chirurgie,* 1909) has met with seven cases of peritonitis from perforation of the gall-bladder, five of whom died in spite of operation and two recovered, one of the latter being a woman seventy-two years old.

Lobingier (*Annals of Surgery,* 1908) relates a case of gangrene of the gall-bladder in which the peritoneal cavity contained a purulent, slate-colored fluid, which stained the omentum. The gall-bladder was friable, black and crepitant; it was distended by gas and calculi could be felt through its walls. The gall-bladder was removed and the remaining portion of the cystic duct was drained, likewise the space occupied by the gall-bladder. The patient recovered.

The great danger of gangrene of the gall-bladder with peritonitis from perforation is due to the deplorable general condition of the patient at the time of operation. It is for no other reason that many surgeons much prefer to simply incise the gall-bladder and focus of peritonitis and thoroughly drain, than to resort to the much more complicated procedure of cholecystectomy.

Hartig, of Carlsruhe, has operated on three cases of perforation of the gall-bladder. The first case was a woman forty-two years old who

was seen on the fourth day after perforation had taken place and general peritonitis had developed. The peritoneal cavity contained a bile-stained fluid and a perforation was found at the fundus of the gall-bladder. The perforation was enlarged, the calculi removed and the gall-bladder was stitched to the abdominal incision. The biliary fistula had closed at the end of two months, but the patient died a few days after her discharge from hospital from a second perforation. This case shows how dangerous it is to leave a gangrenous gall-bladder *in situ* and even admitting that the acute accidents can be dealt with by cholecystostomy, the patient is still exposed to further perforation.

Friedrich, of Marburg, has recorded the case of a woman with a history of gallstones who developed the accidents of a calculous cholecystitis with serious peritonitis which led to the diagnosis of perforation of the gall-bladder. The gall-bladder was removed and the abdominal cavity drained. The gall-bladder contained purulent bile. Its walls, which were from two to three millimetres thick, were completely necrosed, but there were no calculi. Friedrich supposed that the calculi had been expelled and that the infected gall-bladder became necrosed secondarily. Other than for a venous thrombosis of the left leg the patient made an excellent recovery.

Possibly in these cases the surgeon may hesitate to perform cholecystectomy, although this would be the rational thing to do; one must not lose sight of the patient upon whom cholecystostomy and drainage have been done when he has recovered from the results of the perforation of the gall-bladder, for he is still exposed to further perforation. His physical condition should be improved and when his state of health permits, the gall-bladder should be removed. Such has been the procedure of Howard Lilienthal and others and their results justify their actions.

It is none the less true that gangrene of the gall-bladder is a very serious lesion, especially when operation is postponed and time is lost in essaying medical measures which are quite incapable of offsetting the serious complications which are bound to occur, regardless of the apparent mildness of the process at its onset.

The same need not be said when these cases are operated on early, within the first few hours. The patient is still in condition to support cholecystectomy which, in the circumstances, will give results in every way superior to those obtained by medical treatment or drain-

age of the gall-bladder. The excellent results of cholecystectomy are manifest in a rare case, reported by Clairmont and von Haberer, namely, a biliary peritonitis without perforation of the gall-bladder. Schievelbein, of Posen, has recorded another instance and supposes that as there was neither perforation nor ulceration of the gall-bladder the bile must have transcended through the walls of the organ, its fluid contents having been under high pressure. Two other instances of biliary peritonitis with macroscopic integrity of the gall-bladder have been operated by Doberamer, but while Clairmont and von Haberer and Schievelbein's patients suffered from biliary lithiasis, Doberamer's cases were a typhoid cholecystitis and a traumatic cholecystitis, respectively.

Acute cholecystitis is characterized by a very marked pathologic change of the walls of the gall-bladder, by the highly septic character of its contents and by the tendency of the gall-bladder infection to extend. There are three principal pathologic types of acute cholecystitis, viz., the suppurating, the gangrenous and the hemorrhagic. These three forms, in reality, result from two great processes: infection from the blood or from an irritation process due to the presence of calculi. They all give rise to local reaction, from extension of the infection, and to a general reaction. And acute calculous cholecystitides are clinically very much the same in appearance.

A patient who has suffered for a considerable time from paroxysms of hepatic colic is suddenly seized with a violent pain in the right hypochondrium. In spite of rest in bed and morphine the pain persists. It is duller and more deeply situated than in the paroxysms of lithiasis. At first localized in the infrahepatic region, it rapidly extends to the upper abdomen. The abdomen then distends and nausea and vomiting appear.

In spite of muscular rigidity, the characters of the tumefaction can be made out, particularly if the subject be thin. It is in direct continuation with the liver and when the acute phenomena have subsided a little it moves with the hepatic gland during the respiratory movements. It is absolutely immobile transversely. At the apex of the tumefaction, a point of lesser resistance can be detected, which represents the fundus of the gall-bladder gorged with pus. This examination is extremely painful and it is more prudent not to push it too far.

During the entire duration of the acute attack the temperature remains high, reaching 41° C. (104° F.), but is subject to great oscillations. The pulse is rapid. The urine is often rich in bile pigments, although there is no icterus. Slight chills, especially at the onset of the attack, are common.

In other more serious cases, symptoms of hepato-angiocholitis will be present. The enlarged liver is very painful and the integuments are distinctly yellow. The urine is mahogany color. The temperature is high. Occasionally a little pulmonary congestion, especially over the right base, indicates that the inflammatory process is extending by direct extension.

These paroxysms of angiocholitis are, for that matter, often transient and disappear in a few days, only leaving the cholecystitis and pericholecystitis in evolution. But after a time they may leave behind an hepatic cirrhosis which darkens the prognosis.

As I shall endeavor to show, it is possible to bring about a sedation of these symptoms by proper treatment, so that an interval operation may be undertaken later on. The treatment of these acute cholecystitides varies somewhat according to the case. In reality, they offer a very different clinical aspect according to the state of the lesions and that of the patient's health. The muscular rigidity which is always present, as well as the doughiness of the parts, prevent making a satisfactory deep palpation; therefore, it is difficult to appreciate the exact state of the gall-bladder, so that it will be especially the general symptoms and evolution of the process that will decide the question of operation.

The patient is kept absolutely quiet in bed and put on a milk diet. If pain is very severe, morphine is to be given. Hot compresses should be freely applied over the right hypochondriac region as they seem to control the pain better than ice-bags. However, sometimes it is good practice to alternate the hot compresses with ice-bags. If the patient's general condition is considerably involved and if marked phenomena of infection are present, small intrarectal or hypodermic injections of physiological salt solution should be given. If there is much prostration camphorated oil subcutaneously is decidedly indicated.

By the treatment outlined, in those cases where resolution is to ensue, the temperature will fall in lysis, the pain subsides and the

muscular rigidity ceases. The doughiness decreases but does not disappear completely. Sometimes the mass can be moved transversely but above, it cannot be separated from the under surface of the liver.

It will take at least twenty days of this treatment to bring about resolution of a paroxysm of acute cholecystitis. But frequently things do not transpire so simply. Suddenly, when everything seems to be going well, the pain returns and the temperature goes up; sometimes there is also vomiting, and I have occasionally observed the occurrence of paroxysms of very distressing symptoms.

Too much importance should not be given to these returns of vesical and perivesical infections. They sometimes coincide with relaxation of diet and in these circumstances the pain must be controlled by morphine and hot compresses. By this treatment the acute phenomena generally subside and the cholecystitis enters into resolution. As soon as no further diminution of the objective phenomena in the region of the gall-bladder is noted, operation can be decided upon, and although in these circumstances a cholecystectomy will sometimes be difficult to carry out, it can be done by experienced hands.

Besides these cases of resolution, there are others which demand immediate operation. Chauffard makes it a general rule that if, forty-eight hours after the beginning of treatment no improvement is manifest, the gall-bladder must be drained. The patient's general condition is seriously involved; he offers the leaden hue of severe infection; the pulse is rapid and weak, while the temperature reaches a high type with great oscillations. Peritoneal reaction is particularly marked and muscular rigidity extends over the entire abdominal parietes. Locally, all the symptoms of an enormous encysted purulent collection will be found.

It is only too evident that in such cases operation is imperative, but the patient's general condition contra-indicates an extensive interference. The manœuvres necessitated by a complete operation are more than likely to spread throughout the entire abdominal cavity an infection which is still limited to the infrahepatic region or even to the gall-bladder itself. The incision of a gall-bladder filled with pus, with suture to the abdominal incision and drainage of the perivesical collections if they exist, is the operation to be done in these cases.

The general phenomena will not be long in subsiding and the

patient's general condition will improve and a spontaneous recovery may be looked for. But unfortunately the biliary fistula will not close spontaneously. Formerly, the closure of the cutaneous tract of the gall-bladder sinus was advised when the signs of infection had disappeared, but at present it is unquestionably better surgery to do a cholecystectomy which will cure both the sinus and the lithiasis.

Sometimes, but rarely, the gall-bladder will open through the abdominal wall. In most instances the process is one of biliary fistulation, the perforation of the gall-bladder taking place in the midst of adhesions from an ulcerative process produced by calculi combined with a virulent infection of the bile content and advanced pathologic changes of the walls. A septic fluid is given exit through the perforation which, fortunately, cannot pass through the barrier formed by the pericholecystitis into the peritoneal cavity. Therefore, a very large perivesical abscess forms, full of fetid pus and often containing biliary calculi.

These abscesses may become encysted and decrease when resolution of the process occurs, but usually the acute phenomena are so marked, the presence of a pus collection is so evident, that an operation is done before the collection has time to burrow through the abdominal walls. If there is too much delay before the perivesical phlegmon is drained the pus progressively works through the muscular layer, projects under the skin which becomes red and œdematous, then ulcerates and allows the subjacent collection to make its exit. The resulting sinus is usually insufficient to assure proper drainage, but pus mixed with bile, "bile mud" and calculi will escape.

The acute phenomena which accompany the formation of a perivesical abscess subside, but a persistent sinus remains. The pus pocket drains badly and gives rise to retention, with the natural result that the temperature goes up and chills occur. Then the pocket empties itself and things quiet down again until a new attack of retention arises.

The removal of this fistulous gall-bladder is consequently clearly indicated and from personal experience I can say that cholecystectomy can be done quite as easily in these cases as in others less complicated, without any special peritoneal reaction taking place.

Cholecystectomy has been advised during the evolution of these acute cholecystitides, at the onset of the accidents. In 1908, Riedel published statistics of thirty-two cholecystectomies performed at the

onset of the attack and showed this interference in a most favorable light. Körte is also inclined to favor this view. Riedel recommends performing cholecystectomy from below upwards, from the neck of the gall-bladder towards the fundus.

Cotte and Leriche, of Lyons, are inclined to the same technic, having performed a certain number of cholecystectomies for acute cholecystitis with pericholecystitis during the acute phenomena. They believe that in every case where the patient's general condition will permit, the radical operation should be done and drainage of the gall-bladder is only indicated in cases where the bad general condition or very great operative difficulties render cholecystectomy risky or impossible.

Cotte and Leriche believe that if cholecystectomy is to be done at all, it should be resorted to during the first few hours of the accidents of cholecystitis, because at this time, although the infectious process is very virulent, it has not had time to extend beyond the walls of the gall-bladder, while the surrounding peritoneum has not had time to create adhesions. On the other hand, the patient's general condition is still good and he can withstand a cholecystectomy promptly carried out.

Unfortunately, however, the cases of acute cholecystitis are usually seen by the surgeon some time after the onset of the symptoms and in circumstances which would make cholecystectomy difficult to carry out. A gall-bladder can be removed even when extensive adhesions are present, but there is always considerable danger of disseminating the infectious agent which will then block up the lymphatics of the gall-bladder and peritoneal capillaries.

The future of cholecystectomies done in these circumstances is not always brilliant. The operation must be done quickly on account of the poor condition of the patient and very frequently for this reason extensive adhesions develop after the operation which bind the viscera or omentum to the parietal peritoneum with all the disturbances to which this gives rise. Thrombosis of the portal or inferior vena cava is likewise to be feared. Therefore, there is a series of dangers which does not exist, or is at least less foreboding, when cholecystectomy is done during a period of apyrexia. No fixed rule can be formulated, the whole question being one of the judgment and personal temperament of the operator.

After an acute paroxysm, a cholecystitis may become chronic; the febrile accidents subside and the pain calms down. Muscular rigidity disappears but a tumefaction persists in the region of the gall-bladder which continues directly with the liver while below its limits cannot be distinctly separated from those of the abdominal viscera. The tumefaction is slightly mobile transversally and follows the liver in the movements of respiration. Palpation, especially deep palpation, is painful, and occasionally a very mild degree of jaundice persists.

In reality, this is a case of apyretic acute cholecystitis, a cholecystitis in which adhesions of the gall-bladder with the neighboring organs and structures persist, with some small abscesses in the walls of the gall-bladder and in the midst of the omental bands. When the abdomen has been opened it is sometimes difficult to at once recognize the exact condition of affairs in this mass of adhesions and the surgeon should proceed methodically and gently in separating the various organs and finally to reconstruct the anatomical arrangement of the region.

In this case, a cholecystectomy is an excellent operation. It removes a diseased organ and completely frees the region of the numerous existing adhesions which drag on the intestine, pylorus and omentum. It also allows the surgeon to completely clean out the small purulent foci which are invariably scattered through the adhesions.

When an acute attack of cholecystitis has subsided and cooled down, a favorable moment is selected for operating, and in these circumstances cholecystectomy will be easy of execution and the patients will derive great benefit from it.

If an analysis be made of the symptoms offered by these patients and if the results obtained by removal of the gall-bladder be gone over, it can be said that the painful paroxysms have never recurred in any case, either in the form of hepatic colic or in the shape of sudden exacerbations of pain. Icterus never returns, while the condition of the digestive tract is considerably improved. In a word, cholecystectomy results in the cessation of the functional signs of the process.

Locally, not the slightest trace of tumefaction can be detected either superficially or by deep palpation; the abdominal wall is yielding over the underlying structures. The general health improves; strength returns and the patient puts on weight. In some instances a

real resurrection has taken place and it is safe to say that never has the slightest indication of a relapse been noted in the after-history of these patients.

In other cases an acute cholecystitis, in the strict sense of the word, has never occurred, but finally takes place in patients who have had a series of attacks of hepatic colic. At the beginning of the process there is simply a catarrhal cholecystitis; the walls of the gall-bladder are slightly thickened, the mucosa is red and somewhat tumefied. But these lesions become accentuated little by little, the walls retract and become sclerosed, so that the gall-bladder at length only forms a little stump, so to speak, stuffed with calculi. In other words, the process is a sclerous cholecystitis.

In these cases, the infection has gone beyond the cystic duct, and it is precisely in these cholecystitides which are chronic from the start that the condition of the choledochus and hepatic ducts should be particularly watched. The infection may even have extended to the biliary canalicules, so that these sclerous cholecystitides, with a contracted gall-bladder, frequently require a more complete operation than simple cholecystectomy. It is just in these cases that drainage of the choledochus and hepatic duct is required.

This contingency is frequent when one operates on subjects who have suffered from hepatic colic for years and present a persistent tenderness over the region of the gall-bladder, although there is no apparent tumor. In these individuals, subicteric attacks are frequent with little chills and irregular febrile movements, indicating engorgement and infection of the entire biliary tract. The liver itself is painful and slightly enlarged. Sometimes the spleen is hypertrophied.

It is clear that in these circumstances, cholecystectomy alone is insufficient to bring about a disinfection of the biliary tract. And yet more. In these infected biliary ducts further calculous formation may take place and consequently a permanent cure cannot be guaranteed to these patients. It is therefore indicated to drain the principal biliary tract, but in this case it is better to leave the gall-bladder. In the first place, given its small size and the extensive adhesions which transform it into a little mass almost absolutely inseparable from the liver, omentum and intestine, its removal would be a matter of extreme difficulty, not to speak of the danger.

On the other hand, given the possibility of a recurrence, it is better

to leave it in place—draining both it and the choledochus and hepatic duct if this be possible—so that later on another operation may be resorted to, if necessary, without running too great risks for the patient.

But in those cases where the infection is less pronounced or where the lesions have not as yet had the time to undergo their complete evolution, the gall-bladder has not become retracted. Its walls are thickened, its cavity has increased in size and contains numerous calculi of small size (several hundred occasionally) or one large stone which completely occupies it with a little septic bile. Often also, a calculus will be found lodged in the neck of the gall-bladder or in the cystic duct.

A large gall-bladder, such as this, has no adhesions, or at least if any exist, they are few and tender. The principal biliary ducts are free and the liver does not appear to have undergone any morbid change. In many of these cases where drainage of the hepatic duct is advised, a simple cholecystectomy has been found quite satisfactory and the patients have been permanently cured. However, it is only right to say that occasionally recurrences have been observed in the form of hepatic colic.

It is to be remarked that these hepatic colics do not usually last and do not recur after the initial paroxysm. At all events such patients should be advised to follow a strict diet, and better still, to take a cure at Vichy.

Before operating, it is difficult to foresee the condition of the biliary tract and the most astute clinicians are often mistaken. Generally speaking, these forms of cholecystitis are marked by a large, tender, gall-bladder; sometimes during the paroxysms there may be icterus and pyrexia and lithiasis of the principal biliary ducts has been suspected. But at operation, the gall-bladder alone is involved. Now, these patients often pass calculi in their stools some time after the painful paroxysm has passed off. The rapid migration of a calculus has been effected; its passage into the main biliary tracts has set up the appearance of the characteristic syndrome of calculous infection of the hepatic duct and choledochus, but this has not been sufficient to seriously involve these tracts so that drainage of the hepatic duct would be superfluous in such cases and simple cholecystectomy is itself sufficient to cure the patient.

Dropsy of the gall-bladder is one of the forms of cholecystitis which urgently requires removal of the organ. These cholecystitides

are the result of a calculus lodged in the cystic duct and causing its complete occlusion. The bile thus pent up in the gall-bladder becomes transformed; the pigments become absorbed and the fluid liquefies. The vesical glands continue to secrete, the fluid therefore increases in quantity and becomes thinner. All this applies to those cases where the contents of the gall-bladder have remained sterile.

But it frequently happens that the cholecystitis becomes infected and then a large gall-bladder with thin walls, containing a cloudy, purulent and occasionally fœtid, fluid, is the outcome. In other words, there is a chronic empyema of the organ and this is bound to occur when the sterile hydrocholecystitis is left to itself untreated.

Clinically, the history of these patients reveals a lithiasic past. Usually the first paroxysm of hepatic colic dates back many years and then after a long lapse of time acute pain occurs in the region of the gall-bladder, then some temporary tenderness and later some more or less marked digestive disturbances which cause the patient to fear another attack of biliary lithiasis. Then slowly a tumefaction arises in the infrahepatic region and at the same time a dull pain appears in the right hypochondrium.

Icterus is rarely observed, excepting at the onset of the process, at a time when a cure was expected from treatment at Vichy or Carlsbad. Finally, when such a case is examined, an oval tumor, the size of a closed fist or larger, resistant and slightly painful on pressure, can be felt, and which the patient can sometimes feel displacing itself when a change in position of the patient is made.

Some clinicians advise against operation in this form of biliary lithiasis, at least when pain is not marked and the general state of health not too much involved. They vainly hope that such a gall-bladder will decrease in size by spontaneous disappearance of the fluid content and that then recovery will ensue.

What is known of the condition of the walls of the gall-bladder in these cases should lead to the rejection of such opinions. Gangrene of the walls is always to be feared upon the occurrence of the slightest infection, but on the other hand, it cannot be denied that a dropsical gall-bladder may not decrease in size, although physicians do not tell us what becomes of the calculus occluding the lumen of the cystic duct, which must remain lodged therein and continues to

ulcerate the walls of the duct and thus favors the development of infection of the gall-bladder starting from this point.

Kehr has shown that in exceptional cases in which a sterile dropsy of the gall-bladder gives rise to few symptoms, the patient may keep his gall-bladder until pain appears and becomes continued.

Why should these patients be allowed to run the risk of pericholecystitis, gangrene of the gall-bladder or even to be exposed to long suffering when they can be completely relieved, especially so, when at this phase of the process the operation is very simple? There are no adhesions, the distended vesicle protrudes as soon as the abdomen is opened, so that cholecystectomy in these circumstances is easy and gives excellent results.

If the liquid content of the gall-bladder becomes infected, the clinical picture changes. An irregular temperature with high oscillations, or one with a cyclical character, develops, the pulse rises and the patient soon offers the symptoms of evident infection. Pain in the region of the gall-bladder becomes severe, and if the infection is due to the colon bacillus—which is usually the case—it extends to the peritoneum, accidents of pericholecystitis ensue, due to the migration of the infecting agent through the walls of the gall-bladder. Finally, rupture of this empyema into the peritoneal cavity is to be feared.

In sterile or infected dropsy of the gall-bladder cholecystectomy is unquestionably the operation of choice, unless the patient is too weak to withstand the interference, in which case a rapidly performed cholecystectomy, followed by drainage of the organ, must be done.

Cholecystitides are often accompanied by dyspeptic disturbances and this clinical type is important to know. The digestive disturbances may, in reality, dominate the clinical picture.

Sometimes the onset of the lithiasic accidents is ushered in by gastro-intestinal disturbances, such as epigastralgia, a feeling of weight in the stomach, eructations and slow digestion. These symptoms lead to a diagnosis of " indigestion "—so dear to the profession—or to an organic gastric affection when they persist for some days.

At other times the digestive disturbances are tardy in appearing; after a more or less evident lithiasic past a gastric intolerance supervenes, which is occasionally absolute, and in spite of the hepatic antecedents, the physician hesitates to incriminate the process of the biliary tract for explaining the digestive phenomena. It is these

forms that have occasionally given rise to mistakes in diagnosis when they have assumed the clinical aspects of stenosis of the pylorus or duodenum, as it has been only at the operation that a calculous cholecystitis was discovered and recognized as the cause of the symptoms.

Some writers have looked upon these dyspeptic phenomena as being reflex nervous or hysterical manifestations, but such a conception appears to me to be too simple to be applied to the majority of these cases and the lesions met with in the digestive tract during operation contradict such a theory.

Sometimes the cause of the dyspeptic symptoms is discovered during the operative act and is most frequently—when the case was supposed to be a pyloric stenosis—a compression of the pylorus from a distended gall-bladder. At others, the gall-bladder is filled with calculi and by pressure on the pylorus produces occlusion. To this purely extrinsic mechanical obstacle an intrinsic cause of stenosis may become added. The infection of the gall-bladder may extend to the pylorus and the inflammatory process in the walls of the pylorus finally results in occlusion of its lumen.

A pyloric stenosis by compression from a large biliary calculus may end in spontaneous cure, the stone finally ulcerating through the walls of the gall-bladder and pylorus which are in contact, and drops into the gastric cavity. If the calculus can be passed by the natural passages, all is well, but very often these large stones become arrested at some point in the intestine and set up phenomena of occlusion. In other instances the passage of the calculus from the gall-bladder into the lumen of the pylorus may result in the creation of a vesciogastric fistula which, for that matter, may not give rise to any clinical disturbance.

Adhesions due to a pericholecystitis may be encountered which have caused a kink of the pylorus or intestine. This may also be a lesion caused by direct extension of the gall-bladder infection. The infected gall-bladder is in intimate contact with the intestine and the infection extends directly from the vesical walls to those of the gut. These organs may remain glued together, and in one of my cases the gall-bladder was full of stones, compressed the second portion of the duodenum to which it adhered intimately. The patient had been supposed to have a duodenal ulcer and had offered evidences of subpyloric stenosis and even melena.

At other times rather ample membranous veils develop which unite the gall-bladder to the parietal peritoneum and cover the ascending colon and right colic angle. Such gross lesions suffice to explain the symptoms obtained in the patient's history. On the other hand, there are instances where neither a pericholecystitis nor adhesions are found. The digestive troubles—pain, vomiting, constipation—disappear after cholecystectomy and in these circumstances only biliary infection can be incriminated as an etiological factor in the digestive disturbances.

This is the opinion of Cotte and Bressot who believe that biliary infection exceptionally acts upon the digestive tract by the flow of septic bile. Generally speaking, it is by the intermediary of the circulation and innervation that it acts upon the gastro-intestinal functions. These writers also incriminate hepatic congestion which results in causing a certain degree of stasis in the domain of the portal vein.

At other times the infection acts upon the ends of the solar plexus and the irritation of the motor and sensitive filiments produces various disturbances.

Now what lesions have been found in these circumstances? Usually a dilated stomach with a certain degree of atony of its walls. Atony and dilatation of the duodenum has also been recorded. The large intestine may also offer considerable dilatation.

There is here an interesting point for consideration. It might be hoped that once the infected gall-bladder has been removed and the biliary tract made aseptic, the gastro-intestinal lesions should be recovered from spontaneously. This is true for cases where the gall-bladder infection is of not too long standing. After a cholecystectomy performed in these circumstances the dyspeptic phenomena will disappear very frequently, but when the subject has suffered for some time from a so-called affection of the intestine or stomach, that gastro-intestinal atony has become established, complete recovery from these disturbances must not be expected after cholecystectomy. And this applies particularly to cases of dilatation of the stomach or duodenum when very marked with distinct signs of a lesion of these organs, a gastro-enterostomy is indicated as a complimentary operation after removal of the gall-bladder.

Pancreatitis is a too frequent complication of calculous chole-

cystitis to be passed over and a certain number of symptoms that are commonly attributed to the biliary lithiasis in reality belong to it. At present all writers admit the frequent coexistence of pancreatitis and infectious processes of the biliary tract. I would recall that it can occur following two totally different modalities. Sometimes the acute accidents have an onset of formidable gravity. These are accidents of hemorrhagic, suppurating or gangrenous pancreatitis demanding urgent operation and in these cases cholecystectomy can only be regarded as a complimentary operation but often necessary.

But given the seriousness of the accidents which arise with the patient seriously sick, it does not seem good surgery to undertake a radical operation at the start. I shall, therefore, leave aside the study of these acute cases, although they are of the highest practical interest, but do not enter strictly into the subject of cholecystectomy.

On the other hand, the symptomatology of chronic pancreatitis deserves our attention, because any one of its symptoms, combined with signs of biliary lithiasis, realizes the process that Thiroloix has called *cholecysto-pancreatitis,* and requires surgical interference.

Anatomically, *chronic pancreatitis* occurs clinically in somewhat different forms, Chambrol has insisted on this fact, that in biliary lithiasis, sclerosis of the pancreas predominates sometimes in the head of the organ and Riedel has referred to this character, which is clinically perceptible.

In the first phase, the pancreas offers an irregular bosselated aspect; its shape is changed by the process of sclerosis but also discloses a compensating hyperplasia of the relatively intact adjacent lobules.

At a more advanced phase the pancreas atrophies and the sclerosis strangles all the lobules, so that finally only a cord subsists, along which some very hard and unequal masses are scattered.

I shall not insist on the pathologic histology of the chronic pancreatitides, only to say that the connective tissue often develops around the large arteries and veins and that it also sometimes follows the capillaries only to penetrate into the spaces between the acini. It is a sclerosis of the intralobular and periacinous type. There is a predominance of the lesions around the excretory ducts. Whether young or adult, this sclerosis is always accompanied by vascular congestion; the capillary elements are always distended with red blood corpuscles. Around Langerhans' islands there is often an infiltration of young cells

with penetration of bands of sclerosis into the interior of these islands.

The existence of these lesions, of infectious origin, has been explained in various ways and pathologists recognize four principal routes of access to the pancreas by infectious agents, viz., the blood, by the intestine, infection by direct extension, and, lastly, infection by the lymphatics, a theory defended of late by Thiroloix in France and Ornsperger in Germany.

It is enough to have referred to these theories. The study of the symptoms of pancreatitis during biliary lithiasis is more interesting to the practitioner and surgeon.

There is often nothing more difficult than to make an exact diagnosis of chronic pancreatitis. However, this complication of calculous cholecystitis is frequent and it should be at once thought of as soon as a symptom cannot be explained by the existence of a simple cholelithiasis. In the case of acute pancreatitis, be it hemorrhagic, suppurating or gangrenous, it is a question of rapid appreciation and often the diagnosis is not made until the abdomen is opened.

On the contrary, in chronic pancreatitis, the surgeon has all the necessary time at his disposal for a thorough examination of the patient and to unite all the elements which will permit making a diagnosis of pancreatitis. I believe that the capital point is that the existence of a chronic pancreatitis absolutely demands a surgical interference for the cure of the biliary lithiasis.

The physical signs are not constant, all the more so because the lesions, often very gross, of the gall-bladder hinder exploration and monopolize the surgeon's attention.

It is rare, excepting in the case of large cysts, to note any change in the abdominal wall; a little tumefaction in the peri-umbilical region has been mentioned in some cases and Michel has pointed out the fact that the pancreatic tumefaction is quite apt to extend to the left of the middle line. On the right it does not extend beyond a line passing through the tenth chondrosternal articulation. But at this level how is one to decide how much of the tumefaction belongs to the cholecystitis and pericholecystitis and how much to the pancreatitis?

In thin subjects, with easily depressible walls, an hypertrophied pancreas can be palpated and is felt as a rather irregular mass about the size of a fist. The relationship of this tumefaction with the stomach and large intestine will permit the examiner to diagnose the

pancreas without any misgiving. In front of every pancreatic tumor the stomach and intestine will be found. At the onset, the tumefaction, covered by the stomach and intestine will be either sonorous or mildly dull on percussion. As it increases it comes forward and pushes the stomach upwards and the colon downwards.

Finally, these pancreatic tumefactions are often to be found in the lumbar region and lumbar ballottement should always be carefully searched for. On the other hand, they are also characterized by a very slight movement of displacement during deep inspiration. The tumefaction may also present beats which are appreciable to the hand and are due to the increase of consistency and size of the pancreas, and especially to the increase of the tension of the parenchyma with loss of normal elasticity.

The pancreas may manifest its morbid changes by a series of nervous phenomena whose importance is considerable on account of its richness in nerve ganglions and its proximity to the sympathetic plexus.

In the acute cases, pain of exceptional intensity is encountered and forms the greater portion of Dieulafoy's "pancreatic drama." In the chronic pancreatitides the pain assumes a special type, that of Friedrich's coeliac neuralgia and may extend to the precardiac region, resembling angina pectoris both in intensity and from the viewpoint of the effects upon the circulation.

According to Desjardins, the precise localization of this pain in an area corresponding to the point of entrance of Wirsung's duct into the duodenum and extending from five to six centimetres to the left and above the umbilicus, is an excellent clinical evidence in favor of pancreatitis. Chauffard and Rivet have mapped out a small choledocho-pancreatic area corresponding to the head of the pancreas. But two much faith must not be placed in these attempts at minute localization, especially in the case of pancreatitis, as this is not the only lesion present in the case, because the gall-bladder plays the important part.

In thirty-six cases, Deaver found a localization of the pain seventeen times in the epigastrium, fifteen times below the right costal border, once below the left costal border, twice in the lumbar region, and once a general pain without any localization.

These painful phenomena may extend to the costal borders or right shoulder. According to Deaver, the appearance of the pain

has no relation to meals or the nature of the food taken. Vomiting is more frequent than in simple calculous cholecystitis. Deaver noted it fifteen times in twenty-one cases. But how is it possible to say whether the vomiting is due to the pancreatitis or the biliary lithiasis? Deaver does not enlighten us on this point.

Consequently, the physical signs furnished by examination, palpation, the localization of the pain and even its somewhat special features are not enough upon which a diagnosis of pancreatitis can be made. Given a tumefaction of the pancreatico-biliary area it is impossible to know whether it is due to an hypertrophied pancreas alone or to a mass produced by a pericholecystitis agglutinating the surrounding structures together. It is the study of the junctions of the gland and the evident perturbation of its physiology which will allow the clinician to make a positive diagnosis of pancreatitis.

But each one of the functions of the pancreas is duplicated or substituted by that of some other organ and this explains why so often the lesion of pancreatitis may only give rise to a few little disturbances. On the other hand, the multiplicity of the methods for the detection of pancreatic lesions does not prove their absolute value.

Icterus appears to be one of the most constant symptoms of chronic pancreatitis and it may be asked if the chronic icterus met with in certain chronic cholecystitides without calculous occlusion of the choledochus may not be due to compression of the choledochus by an inflamed pancreas. For Quénu and Duval the icterus resulting from a pancreatitis is less pronounced and subject to greater variations than icterus from calculous occlusion.

Kehr attributes these different aspects to a calculus in the upper portion of the choledochus. This variation in the intensity is not enough to characterize pancreatitis, all the more so because in some of my case-histories there was pancreatitis complicating calculous cholecystitis in which icterus remained with the same characters during the entire evolution of the process, progressing regularly and becoming aggravated as in the case of cancer of the head of the pancreas.

Therefore, icterus is a sign of probability in favor of pancreatitis, but nothing more, and consequently is not pathognomonic.

Rapid and continued emaciation, when combined with progressive icterus, is a good sign in favor of a sclerosing pancreatitis. It is

always considerable. Emaciation due to cancer would not be so rapid, but this would be a poor index for the recognition of the affection.

As a very important sign of pancreatitis anæmia has been given by some writers; the red blood-corpuscles are invariably diminished in number, pale, and present numerous degenerations; the percentage of hæmoglobin is always below the normal. Now, is this anæmia caused by the pancreatitis *per se* or is it related to the patient's general condition? This is a question difficult to solve, and as for Courvoisier-Terrier's law, it is of little help for appreciating the degree of pancreatitis, and one will finally be led, in face of a chronic icterus, to accept Kehr's table of probabilities, viz.: 70 per cent. for cancer, 10 per cent. for biliary calculus, and 20 per cent. for chronic pancreatitis.

All things considered, an examination of these cases can only permit one to suspect a chronic pancreatitis, and if one desires to affirm before operation that a chronic pancreatitis exists, laboratory researches must be carried out whose value is not absolute and in spite of them the diagnosis remains most uncertain.

I shall not refer to the very numerous procedures which have been proposed for exploring the pancreas. Some are applicable to laboratory work on animals, such, for example, as that of Boas, who tries by forced massage to cause the duodenal content to flow back into the stomach in order to withdraw it by a stomach catheter. The same may be said of Max Einhorn's method, which consists of making a small cup penetrate into the duodenum and then withdrawing it filled with the duodenal fluid, after having made sure by radioscopy that the cup is certainly within the duodenum. This procedure seems to me to be wanting in precision. The cup may bring back other material than pancreatic juice and I also wonder how the duodenum of these patients can support such an exploration.

The examination of the fæces and urine will furnish more precise data and I shall briefly describe their technic. The examination of the fæces will reveal the incomplete utilization of the fats, albuminoids and starches after the ingestion of a test meal.

The Imperfect Utilization of Fats.—According to R. Gaultier, the percentage of excreted fats, which is from 35 per cent. to 40 per cent. in disturbances of the biliary excretion, reaches 70 per cent. to 80 per cent. in changes of the pancreas exclusively, to attain 90 per cent. or more when the biliary and pancreatic secretions are both

disturbed. Brugsch comes to similar conclusions; his figures are not so high but their ratio is the same.

The Imperfect Utilization of the Albuminoids.—The researches relating to the albuminoids effected after a test meal consisting of minced meat, shows the presence of muscular fibres in considerable amount in the fæces.

Schmidt's procedure consists in giving the patient little cubes of meat enclosed in gauze bags. Microscopically, one ascertains if the detritus of meat still contains its nuclei. The pancreatic juice alone possesses the power of digesting the nuclear substance, the absence of the nuclei will consequently indicate that the secretion is normal and if they are present there is a pancreatic insufficiency.

The Imperfect Utilization of Starches.—This research gives no precise result.

It is above all the research for the imperfect utilization of the fats that have been extensively resorted to, but it must not be forgotten that this method has been regarded as lacking in precision in its procedures of analysis. On the other hand, steatolysis is not solely due to the action of the pancreas, because the action of the gastric and intestinal lipases also come into play. Finally, Rosenberg's experiments tend to prove that there is no very considerable disturbance in the absorption of fats excepting when there is almost a complete sclerosis of the pancreas.

The presence of the products of pancreatic digestion in the fæces has also been searched for and the dosage of amylase and the secreted lipase has been made, but these researches are lacking in precision in the procedure of dosages.

There remains the examination of the urine. Sahli's reagent consists of formaldehyde capsules resistant to the gastric juice but soluble in the pancreatic juice, and containing a substance endowed with a great rapidity of absorption, which can be found in the urine. Richaud denies that this procedure has any value whatsoever.

Cammidge's reaction has been employed by a number of surgeons, some of whom attribute it much value. Mayo Robson, Moynihan and Kehr were of the opinion that when this reaction was positive the diagnosis of pancreatitis could be made with certainty.

In lithiasis of the gall-bladder Kehr found that pancreatitis is less common than in lithiasis of the main ducts, but it nevertheless

exists in 14 per cent. of the cases of calculous cholecystitis when Cammidge's reaction is employed for detecting pancreatitis.

Kehr accords great confidence to Cammidge's procedure. He resorted to it in thirty-two cases of undoubted gallstones, and it was positive in twenty-five and negative in seven. Among the seven negative cases four were operated on, and in all four Kehr found that the pancreas was absolutely intact. Of the twenty-five positive cases eighteen came to operation, and in only one did the reaction prove erroneous, yet even here, instead of a pancreatitis there was a cancer of the choledochus and pancreas. Taken all together, in this series Cammidge's reaction was misleading only once out of a total of twenty-nine cases. In a case of acute pancreatitis seen at a later date, this test was negative both before and after operation, which led Kehr to admit that Cammidge's test was of value only in cases of chronic pancreatitis.

Schmidt, of Wurtzburg, after a series of thirteen experiments, comes to less absolute conclusions. One positive reaction is for him not enough to conclude absolutely that a pancreatitis exists, because other morbid processes may provoke the appearance of this reaction in the urine. At the most it is a sign of probability and Kinnicut is of the same opinion.

On the contrary, Goodman, of Philadelphia, after an experience of sixty-two cases, believes that Cammidge's reaction is a sure means of diagnosis and this has been Mayo Robson's opinion.

Grimbert and Bernier after long experimentation believe that the body which is characteristic of a pancreatic lesion in Cammidge's reaction, is found normally in all urine, and has no clinical signification. Deaver is sceptical in regard to this reaction, as well as many others.

On the other hand, glycosuria would be in favor of a pancreatic lesion and Gulere regards it as one of the best diagnostic elements of pancreatitis that we have.

Therefore, it would appear that the diagnosis of pancreatitis cannot be made with anything like certainty during biliary lithiasis. An ensemble of data should cause the clinician to suspect it and he should never neglect to explore the head of the pancreas when operating on the biliary tract.

The existence of a pancreatitis complicates the operative prognosis, and it would seem to be of a nature to demand a more complex interference than a simple cholecystectomy and that in particular, drainage of the choledochus and hepatic duct is necessary.

In the notes of eighty cases of cholecystectomy in my possession, pancreatitis was only found in four. The main biliary tracts were perfectly free, so that cholecystectomy was considered sufficient and the ultimate results justified this opinion. The four cases of drainage of the ducts made perfect recoveries.

OCCLUSION OF THE ARTERIES OF THE LIMBS IN DIPHTHERIA

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I PROPOSE to study in this paper a rare but interesting complication of malignant diphtheria, namely, occlusion of the arteries of the limbs following *cardiac thrombosis*. Among the many manifestations of hypertoxic diphtheria, the most frequent and at the same time, the most serious, are unquestionably cardiac complications. It can be said that cardiac insufficiency, no matter from what cause, is one of the constant elements of this secondary syndrome of malignant diphtheria, first mentioned by Sevestre and remarkably studied by Marfan.

If, in some cases, the functional insufficiency of the heart is dependent upon an anatomical change of another organ, either of the central or peripheral nervous system, or what is still more common, of a vascular gland and the suprarenals in particular, it is nevertheless certain that in the majority of cases a sufficient explanation can be found in lesions of the cardiac muscle. Diphtheritic myocarditis is one of the most complete types of the acute myocarditides and one of the best known. Clinically, pathologically and experimentally its great frequency has been established, as well as the part it plays in the evolution of the serious forms of diphtheria.

Under the influence of the pathologic changes in its walls, the cardiac muscle loses its tonicity and becomes distended by the blood-pressure, and it is well known that dilatation of the cardiac cavities is one of the first signs indicating functional insufficiency of the myocardium. The intracardiac circulation is thus changed; the blood stagnates in the cavities of the heart, particularly in the auricles; coagulation of the blood may arise, all the more readily because the composition of the blood is profoundly changed by the diphtheritic infection. Here, therefore, is the first explanation of emboli which are the consequence.

But another pathogenic factor may intervene in their production. Many years ago Bouchut and Labadie-Lagrave showed that during the evolution of diphtheria the endocardium may be involved on its own account. The existence of a diphtheritic endocarditis remained for a long time afterwards an unknown quantity, being put in the shade by the numerous researches to which diphtheritic myocarditis gave rise and this lesion appeared sufficient for explaining all the obscure cardiac accidents arising in diphtheria. The studies of Marfan, Deguy and Weill, and later Barbier, have again drawn attention to the importance of morbid changes in the endocardium and have shown the great part that they may play in the production of cardiac thrombosis. Endocarditis of the apex, whose existence can be regarded as unquestionable, may consequently be the origin of embolic accidents susceptible of causing gangrene of the limbs.

Finally, there is still one other problem to be solved. Are these gangrenes of the limbs always the result of arterial emboli originating in the heart? Can they not have as origin a thrombus arising on the spot? In other words, does a diphtheritic arteritis exist? This is a problem difficult to solve in the present state of our knowledge and is too important from the viewpoint of general pathology to be passed over in silence, in spite of the uncertainty surrounding it.

It must not be assumed that all gangrenes of the limbs met with in diphtheria are necessarily the result of occlusion of an artery. Gangrene may be met with in this disease which is due to quite a different pathogenesis, such as symmetrical gangrene of the extremities, which can be placed under the same heading as Raynaud's disease, septic gangrene due to anaërobic infection, etc. It is important to be able to distinguish these various types from each other, as they are so different, not only in their clinical evolution but also in their therapeutic indications.

I have been able to collect seventeen cases from the literature to which I can add one of my own and these form the basis upon which the present paper is written, but for the sake of brevity they will not be recorded.

Vascular occlusion of the limbs in diphtheria is hardly mentioned in the text-books, but it is certain that it is much more frequent than before the advent of antidiphtheritic serotherapy, especially since the intensive treatment with repeated massive doses of serum in the

malignant forms of the disease. Before serotherapy had appeared upon the scene, almost all the patients with severe forms of diphtheria rapidly died in a few days, struck down by the intense intoxication and rare were those who resisted the process for several weeks. In the majority of cases death took place on the eighth to the tenth day of the disease at the very latest. At present, intensive serotherapy has modified the evolution of malignant diphtheria; about 50 per cent. of the cases recovered after having presented more or less serious complications for three to five weeks; those who die at present, resist the infection longer than formerly, and if we leave aside cases of hypertoxic diphtheria met with in some epidemics and cases treated tardily from the fifth to the seventh day of the disease, it can be said that, in the vast majority of cases, death rarely takes place before the fifteenth day of the affection.

Now, I shall endeavor to show that arterial occlusion is a late complication, hardly ever appearing before the end of the second week and still more frequently in the third week of the diphtheria. Consequently, if this complication appears less exceptional at present, it is because the exhibition of serum in large doses prolongs the patient's life, likewise the duration of the disease, and thus allows this ordinarily tardy complication to develop, the lesions giving rise to it having had time to become constituted. Far from being an unfortunate consequence of serotherapy, arterial occlusion is one of the many proofs of the beneficent action of serotherapy in the most malignant forms of diphtheria.

However this may be, and even taking into consideration the greater frequency of this complication during the last twenty years, arterial occlusion of the limbs is much less frequent in diphtheria than in the majority of other acute infectious diseases. Barraud has collected one hundred and three cases of gangrene of the limbs following infectious diseases in young subjects; diphtheria is far below typhoid fever, measles and scarlet fever in his statistics. But this is a classic fact upon which it is quite unnecessary to insist.

Arterial occlusion of the limbs does not occur indifferently in all cases of diphtheria. Generally speaking, it is a complication of the more hypertoxic forms of the infection. This fact is distinctly evident in the eighteen cases I have collected. Usually this complication followed a diphtheritic angina, much more rarely the initial localization

of the infection was in the larynx (Poupon's case). It is known that usually croup is a manifestation of a mildly toxic diphtheria, at least when it occurs as a predominating localization of the infection.

In three of the collected cases the diphtheritic angina appeared to be cured when the accidents following the arterial occlusion suddenly appeared in one or several members. One might be led to suppose that, in these cases, the arterial occlusion was a complication of a mild diphtheria of low toxicity. In reality, if the case histories are carefully studied it will be seen that they were serious from the onset. In one of them, thick false membranes lined the throat and nasal fossæ and elimination was abundant. There was dyspnœa and the patient's general health was markedly involved. All such symptoms are absent in a mild angina and indicate a rather severe intoxication from the Klebs-Loeffler bacillus.

In another case the child appeared to have a vulgar croup from which it recovered after tracheotomy, but some days later a relapse of the diphtheria occurred which presented all the signs of a malignant infection. In yet another case, the notes of which give but few data as to the characters of the disease at its onset, it is noted that there was dyspnœa and that the attending physician was obliged to give several injections of serum in order to overcome the local manifestations of the process, all of which is little in favor of the case being a mild one.

It is, therefore, only right to say that arterial occlusion is always the consequence of a serious form of diphtheritic infection, usually of the hypertoxic variety.

Arterial occlusion appears almost exclusively in cases of diphtheria which have developed symptoms of cardiac insufficiency. In ten of my collected cases symptoms of cardiac paralysis were noted and in most of them they were so intense as to overshadow all others. The other case histories are very incomplete and contain no precise data on the functional condition of the heart. Therefore, they cannot be taken into consideration from this viewpoint. The existence of a cardiac process should therefore be looked upon as almost constant, if not entirely so, in subjects exposed to arterial occlusion of the limbs in diphtheria. It is an etiological notion of capital importance on which I shall have occasion to refer to many times, but it has been necessary to expose its real value at the beginning of this study.

All subjects with malignant diphtheria which gives rise to cardiac complications are exposed to arterial occlusion of the limbs; no individual condition appears to play the part of a predisposing factor. Nevertheless, it is interesting to remark that all the cases occurred in early or late childhood. In the fourteen cases where the child's age is given, the complication was met with in children as the following table shows:

2	years	2 cases
2½	years	1 case
3	years	1 case
4½	years	1 case
5½	years	1 case
6	years	1 case
7	years	1 case
7½	years	1 case
8	years	2 cases
10	years	1 case
13	years	2 cases

It will be seen that this complication is not equally frequent during the different periods of childhood. It is met with especially between two and ten years of age; it is far less common in older children and adolescents; it has never been encountered in infants. These facts are easily explained. We know, in fact, that diphtheria is more common in second childhood than in adolescence. Likewise, this infection is less frequent in infants and in them its evolution is quite different; it attacks with predilection the respiratory tract, and, when it is severe, it rapidly causes death by broncho-pneumonia before cardiac complications and their resulting complications have had the time to be produced.

But it is more difficult to explain why arterial occlusion of the limbs in diphtheria has never been met with in adults. In them diphtheria is unquestionably less common than in children; but it nevertheless is not what can be called uncommon in older subjects. On the other hand, malignant diphtheria is relatively more frequent in the adult than in children; the cardiac complications are particularly to be feared, especially in their severer grades. Diphtheria is most surely not fourteen times less common in the adult than in the child.

This very particular predisposition of childhood to arterial occlusion of the limbs in diphtheria is in singular contrast with what is

observed in the majority of other infectious diseases and notably in typhoid fever. In this latter disease, as is well known, gangrene of the limbs is met with much more frequently in adults than in young subjects, a fact which is insufficient to explain the difference of frequency of this infection at the different ages of life. But it is impossible to assimilate these two infections from this viewpoint, because the arterial occlusions that they produce are not due to the same mechanism. In typhoid fever they are ordinarily the result of an acute arteritis; in diphtheria, as I shall show, they are almost always, if not always, caused by emboli from the heart. It would consequently seem that acute arteritis has a predilection for adults, while arterial emboli—in the large trunks of the limbs—take place with greater ease in childhood. Thus may be explained why the one or the other act differently during the evolution of various infections susceptible of giving rise to arterial occlusion.

Of thirteen subjects whose sex was given, eight occurred in boys and five in girls. I have been unable to produce any other predisposing cause than the early life of the patient.

In all my cases the clinical picture was practically the same. The patients were children who, from the onset of their illness, presented the symptoms of malignant diphtheria. The onset was sudden very often, the false membranes appeared rapidly and soon invaded the entire pharynx as well as the nasal fossæ and were freely expelled by the nostrils; the cervical lymph-nodes were greatly enlarged, enough to make the neck look enormous. The child is pale and depressed, the urine scanty and very albuminous; the pulse is rapid and the blood-pressure very low. Everything already indicates the intensity of the intoxication and therefore the gravity of the prognosis.

However, under the influence of serotherapeutic treatment the local accidents subside: the false membranes become detached and are eliminated by degrees; the lymph-nodes decrease in size and by the end of a week or ten days the aspect of the throat is apparently normal. But at the same time that the local symptoms retrogress, the general symptoms still persist and become accentuated; the phase of angina is succeeded by the secondary syndrome of malignant diphtheria.

We are now at the eighth or tenth day of the disease. The child is livid, almost cadaverous, while the asthenia has not ceased to increase. An early paralysis of the vellum palatinum occurs, soon fol-

lowed by vomiting, which may be frequent or even incoercible, and epigastric pain. But what especially strikes the observer and is foremost in the clinical picture, are the symptoms of cardiac insufficiency which are never absent.

The pulse is usually very rapid at 130 to 160 per minute, but on the other hand it may, in infrequent cases, be very slow, the beats ranging between 50 to 60 per minute. The blood-pressure is very low. Occasionally the pulse is unequal or even irregular. A considerable dilatation of the heart often occurs; the sounds are dull while at times a *bruit de galop* is heard, at others a mitral systolic murmur is heard which might be attributed to an endocarditis were it not known that it is, in reality, a functional murmur due to the extreme dilatation of the left ventricle.

The hepatomegalia and the considerable decrease in the secretion of urine, due to diphtheritic hepatitis and nephritis, also indicate cardiac paralysis and dilatation. There are few functional symptoms indicating the cardiac distress, but there is one which is hardly ever wanting, namely, a polypnœa *sine materia,* quite independent of any morbid change in the lungs and frequently accompanied by cyanosis of the limbs. Sometimes a violent paroxysm of dyspnœa takes place, the little patient's distress is extreme, the cyanosis invades almost the entire body, the pulse becomes imperceptible and death seems near, when at length the symptoms progressively subside. Such are the characteristic paroxysms of cardiac thrombosis.

It is in the midst of this dramatic state of affairs that new symptoms brutally burst themselves upon the scene, namely, those of occlusion of a large arterial trunk in a limb. Suddenly, without any prodromes, the patient experiences a violent pain localized in one or several members. The pain is intense, causing the child to cry out and producing an extreme nervous agitation.

If the patient be examined at this time, it will be observed that either immediately after the appearance of the pain or perhaps a little later, that the involved limb or limbs have changed in aspect. Over a more or less considerable extent starting from the distal portion, the integument will have taken on a whitish, waxy tint and is discolored in irregularly disseminated areas. Over this entire region the skin is cold and the peripheral temperature will be found to show a difference of from 6° to 10° C. between the diseased and healthy fellow limb. A

total muscular impotency will be found to exist or at least it will be very accentuated; the patient will be unable to make any movement of the limb and the slightest motion will exaggerate the pain. Nevertheless, if the sensibility to touch, temperature or pricking be explored, it will be found considerably diminished and more frequently completely abolished throughout the entire extent of the limb where the waxy color of the skin exists.

This striking contrast between the superficial and deep pain constitutes the well-known phenomenon of painful anæsthesia and offers a very great diagnostic value. The reflexes have disappeared both cutaneous and tendinous, and if the pulsation of the arterial trunk of the limb and its branches be sought for, as it should be, the pulsations will be found absent below a certain point which corresponds to the seat of the occlusion, a symptom of capital importance which to a certain extent, will determine the seat of the occluding clot. It is much more uncommon to be able to feel the artery in the form of a hard and painful cord at the site of the lesion. With these very distinct local phenomena no appreciable change occurs in the general symptoms and the temperature remains unaffected.

Such are the initial symptoms, which are truely characteristic, and which indicate an occlusion of a large arterial trunk in a limb.

The evolution of the accidents may vary, and from this viewpoint three groups of events are to be distinguished. In the first death soon takes place, due to cardiac disturbances, before the consequences of the arterial occlusion have had time to manifest themselves. The patient dies in from twenty-four to thirty-six hours, usually very suddenly. In some instances, the influence of the arterial process on the sudden aggravation of the cardiac accidents, appears to be unquestionable. It would seem that the nervous reaction and restlessness caused by the pain may be quite sufficient to break the unstable equilibrium offered by these profoundly intoxicated patients, presenting serious cardiac lesions. Since a simple change in position may cause sudden death in such diphtheritic patients, there is all the more reason that a painful complication may force the work of the heart and bring about its functional bankruptcy.

The second group comprises those cases in which the circulation becomes reëstablished or the resulting accidents are only temporary in duration. Some hours after the onset of the occlusion the color of

the limb returns, it becomes warm, and the sensibility also comes back, at first obtuse and then more precise. A supplementary circulation has been developed sufficient to assure the nutrition of the limb in spite of the fact that its principal artery has been occluded. In other instances it is only after several days that the accidents disappear; the limb, after having been decidedly waxy in hue, became mottled by cyanotic, or even purpuric, spots, sloughing seems inevitable and yet at about the third or fourth day the areas of cyanosis are seen to diminish in extent and number at the same time that sensibility and the reflexes return; little by little the limb assumes its normal aspect.

But in these circumstances where a sufficient collateral circulation was only tardily developed, the limb, profoundly disturbed in its nutrition, slowly recovers the integrity of its functions; the slightest fatigue is enough to cause the cyanosis to return for several months, as well as the obtusion of the sensibility and numbness. If the recorded case histories be gone over it will be seen that these temporary accidents have always been the prelude of more serious ones which, in such cases, should invariably lead the practitioner to make a very guarded prognosis.

At times the accidents reappear in the same limb affecting, so to speak, an intermittent behavior with two—sometimes three—alternatives of amelioration and aggravation, either because the arterial thrombosis becomes completed and slowly extends, or for the reason that fresh occlusions form above the first one in the initial portion of the artery. Usually the accidents arise in one or several other limbs which have not been involved at the onset. They may also be temporary in character but finally sloughing is bound to occur in one or more of them. Finally, in some cases, the arterial occlusion will involve other arteries, either the abdominal aorta and more particularly the visceral arteries, notably those of the brain, and lastly, the branches of the pulmonary artery. It is, however, not inadmissable that occlusion of one or several arteries may not be followed by *restitutio ad integrum* and without the advent of any new complication which might result in disaster, but no such case has been reported so far as I am aware, so that if any do exist they must be exceedingly few in number.

The third group comprises those cases in which the arterial occlusion underwent a progressive evolution towards sloughing; these

are the most numerous. The limb becomes progressively more painful, the skin assumes the waxy tint and within twelve to twenty-four hours, the areas of cyanosis extend, unite and become dark in color. After a variable lapse of time, usually from four to seven days, a brownish patch appears over the lower part of the limb, which soon turns black; the skin shrinks and becomes hard and by percussion gives a wooden sound. The underlying structures also diminish in volume as they likewise become dry; the fingers or toes, as the case may be, become retracted—briefly, a dry gangrene develops.

The area of the gangrene is more or less extensive; usually it becomes quickly limited so that by the twelfth to the fifteenth day it no longer has any tendency to extend. Occasionally it only involves the fingers or toes, but it may at the same time occupy a portion of the hand or foot, while in some cases it may involve the entire foot and lower portion of the leg. In no case was it more extensive.

A line of demarcation forms at the limit of the gangrene and healthy tissues, but in no case did the gangrene assume the moist variety, although in several instances some blebs surrounded by an œdematous zone appeared, but gave rise to no further trouble, they having retrogressed by the use of aseptic or antiseptic dressing. While these local accidents are in progress, the diphtheritic intoxication continues its evolution and it is then that the cardiac accidents slowly retrogress, although they do not disappear before the thirtieth day of the disease. It is also at this time that a generalized diphtheritic paralysis is met with which lasts for several weeks or months.

Finally, the general health improves, convalescence becomes established, and by the fortieth to the eightieth day of the disease the case can be turned over to the surgeon for amputation of the diseased parts without compromising the life of the patient, who will recover at the expense of a more or less serious mutilation according to the extent of the gangrene.

Such is the clinical evolution of occlusion of the arteries in diphtheria. It now remains for me to discuss some peculiarities that it presents.

In the first place, let us see at what time in the course of diphtheria this complication arises. It is nearly always a late complication and in only one instance, that reported by Escherich, did it take place as early as the eighth day of the disease; cerebral accidents—hemiplegia

and convulsions—due to the occlusion of the sylvian artery, therefore a complication of the same nature, had already occurred on the sixth day. This case must be regarded as an exception. In nine other cases where the data of the development of this complication is noted with precision, the accidents were much more tardy, namely, on the thirteenth, fourteenth, fifteenth, seventeenth, eighteenth and nineteenth day, respectively. Therefore, it is during the third week of the diphtheria that arterial occlusion is more apt to occur.

It is, however, inexact to regard it as a complication of convalescence because in nearly all the cases the diphtheria was in full evolution, even at a phase of the infection when the patient's condition was more serious than it appeared. In reality, this complication is one of the accidents of the secondary syndrome of malignant diphtheria; it appears at a time when the fundamental symptoms of this syndrome, indicating cardiac insufficiency, have already been present for several days.

At all events, the onset is sudden. Without any prodromes the cessation of the circulation is complete in the segment of the limb supplied by the occluded vessel, whether the occlusion be temporary or durable, ultimately resulting in dry gangrene.

Occlusion may take place in the arteries of the upper, as well as of the lower extremities, but the latter are by far the most frequently involved. In only two of my eighteen cases did occlusion occur in the upper limbs and in both it was on the right side. In fifteen cases the occlusion was in the lower limbs; five times both limbs were involved, but usually in an unequal degree; five times the complication arose in the right lower limb and four times in the left; in one case the side was not indicated. Such localizations are not in any way special to diphtheria; it is a usual thing that, in infectious diseases, arterial occlusion has a predilection for the lower extremities, whether the process is an arteritis or embolus.

In all the eighteen cases the gangrene was dry. Sometimes only one arterial trunk was occluded and gangrene resulted. This occurred in seven. At others, several arteries were involved, either simultaneously or successively, and in these the occlusion occurred in both limbs. In two cases, simultaneous occlusion of the principal artery of the two lower limbs was followed by gangrene in both. On the contrary, in six cases the collateral circulation became sufficiently devel-

oped in one of the limbs involved so that in a few days, or even hours, it had assumed its normal aspect, while in the fellow limb it was insufficient to prevent dry gangrene from invading a more or less extensive portion of the member, although the extent of the process was always much less than that of the part supplied by the occluded vessel.

In Rolleston's case the main artery of the right lower limb became occluded on the seventeenth day of the diphtheria, but the collateral circulation became established within a few hours; eight days later both lower limbs were involved at the same time, although in twenty-six hours they had assumed their normal aspect. Finally, five days later the accidents reappeared in the left limb, but this time the occlusion ended in gangrene of the foot and a good part of the leg within a few days.

The extent of the gangrene varies considerably from one case to another. In four cases it was necessary to amputate at the upper third of the leg. In five cases the process was less extensive, although the symptoms pointed to an unquestionable occlusion of a large vessel —the humeral, femoral or popliteal artery. In these cases the gangrene was limited to the fingers or toes, although it invaded the superficial structures of the dorsal aspect of the hand or the dorsal and plantar aspect of the foot. Recovery took place after elimination of the necrobiotic tissue without surgical interference or else only a limited surgical operation was required on the lower limb. In one of these five cases, after occlusion of the popliteal the gangrene only involved the toes and dorsum of the foot. In another, following occlusion of an artery of the leg a superficial gangrene occurred which involved the heel and external portion of the dorsum of the foot.

The third case was an occlusion of the right humeral artery ending in a gangrene limited to the superficial tissues of the ungual phalanges of the four last fingers and a small portion of the ulnar region of the dorsum of the hand. In the fourth case following occlusion of the right humeral, the gangrene only involved the totality of the index and medino. And, lastly, the fifth case, in spite of occlusion of the popliteal, the gangrene remained circumscribed to the toes and the superficial structures of the anterior half of the plantar aspect of the foot; amputation of a small part of the latter was all that was required. Consequently, the extent of the gangrene does not depend solely on the size and importance of the occluded artery;

it is more particularly in direct relation with the more or less complete establishment of the collateral circulation which in the general run of cases is sufficient to reëstablish the circulation in the greater part of the territory supplied by the occluded vessel. This is a general law of arterial pathology and applies in diphtheria as in other infectious diseases.

Besides the arteries of the limbs, others may become occluded at the same time in diphtheria. Embolus of the pulmonary artery was met with in one case. Pulmonary emboli are, perhaps, the most commonly encountered in diphtheria and both Marfan and Escherich have insisted on their relatively considerable frequency in the malignant forms of this infectious process. They are the consequence of thrombosis of the right heart, and, although they are more apt to occur alone, they may, as in Poupon's case, precede or accompany occlusion of the arteries of the limbs which is, as I shall show, the result of thrombosis of the left heart.

When pulmonary embolus makes itself evident clinically there is dyspnœa, a collection of fluid in the pleura, foci of pulmonary consolidation surrounded by a zone of congestion and œdema; in children a characteristic hæmoptie expectoration is hardly ever met with, a fact which often makes the diagnosis a matter of considerable difficulty.

Besides occlusion of the arteries of the limbs, thrombosis of the left heart may at the same time cause occlusion of the cerebral vessels, made evident clinically by convulsions, hemiplegia and aphasia. This was noted in three of my eighteen cases. Cerebral emboli are much more common in diptheria than emboli in the arteries of the members, and Rolleston has been able to collect sixty-five cases.

It is not exceptional to note signs indicating a temporary occlusion of the abdominal aorta before occlusion of the vessels of the limbs occurs. It manifests itself by violent abdominal pain seated especially in the periumbilical area and by absence of pulsation in the femoral arteries. It may occur alone and be permanent, in which case death usually takes place very quickly. But it would seem that occlusion of the abdominal aorta may be also temporary, as if the clot, at first arrested in the aorta, probably at a point near its terminal division, becomes broken up under the blood-pressure and penetrates farther down, finally occluding the arteries of smaller calibre of one or both lower limbs.

Finally, emboli may lodge in the spleen, kidneys or liver, but usually this process is overlooked during life and is an autopsy finding.

The outcome of diphtherias, complicated by occlusion of the arteries of the limbs, is variable. In seven of our cases death took place quickly and was due to the high grade intoxication of the patients resulting in cardiac complications. The subjects died suddenly from cardiac collapse or syncope and in no case was death directly caused by the process in the arteries of the limbs. A spreading gangrenous process with high temperature and giving rise to organic intoxication from poisons resulting from autolysis of the necrotic tissues has, so far as I know, never been met with in diphtheria. Nor has putrid transformation, due to a superadded infection from anaërobic bacteria been reported.

In most cases recovery has taken place. The accidents of diphtheritic intoxication have slowly retrogressed; the cardiac disturbances have disappeared while the dry gangrene and the resulting eschar have undergone their evolution; convalescence becomes established, either spontaneously or more commonly from surgical interference and a complete return to health takes place. This occurred in nine cases.

The diagnosis of arterial occlusion during diphtheria is usually devoid of difficulty. When, during a hypertoxic diphtheria complicated by cardiac accidents of a more or less serious type, a sudden violent pain takes place in one of the limbs, an arterial embolus should immediately be suspected. The aspect of the limb, cold, waxy or cyanosed, the disappearance of the sensibility and the reflexes, and above all the absence of pulsation in the arterial trunks of the limb readily affirm its existence.

I shall not insist upon all the mistakes that are to be avoided because it would be necessary to give the semeiology of all painful affections of the members having a sudden onset. It seems to me preferable to merely indicate those affections which may occur during diphtheria and lead to a mistaken diagnosis. In point of fact, gangrene of the limbs not due to an embolus has been noted in this infectious disease. A certain number of cases of symmetrical gangrene of the extremities of the Raynaud type have been recorded, so that it is important to differentiate them from the gangrenes due to embolus, because the prognosis and treatment are essentially different in the

two processes. Raynaud's disease results in a very limited superficial gangrene, only exceptionally requiring surgical measures.

Raynaud's disease does not occur merely in the malignant forms of diphtheria since it has been met with even in the mild types of diphtheritic infection. It is not preceded by cardiac complications and generally appears late in the process at a time when convalescence has been in progress for some weeks or even months. It develops in paroxysms and all degrees may be observed, at times a simple asphyxia of the limbs, at others an asphyxia followed by gangrene. Usually the process is symmetrical and although it may be localized to the toes of both feet, it may likewise at the same time involve the fingers, nose and ears. It never gives rise to absence of pulsation in the parts involved, consequently its characters are very different from those of arterial occlusion from embolus.

There is yet another variety of gangrene that may be observed in diphtheria. This is disseminated cutaneous gangrene met with more particularly in very young subjects. This process is a septicæmic infection caused by anaërobic bacteria producing true gangrene from emboli at various parts of the cutaneous surface, as Veillon's researches on the subject have demonstrated. But in these cases the areas of gangrene are not confined to the limbs but appear on other portions of the body and very often are more marked on the thorax and abdomen than anywhere else. The evolution of the process is by successive outbursts; the gangrenous patch is not long in softening and then presents all the characters of the moist variety. The process is not merely a necrosis of the tissues but more especially a putrid infection of the structures involved. A high temperature and a profound involvement of the general health complete the symptomatology of this affection which if known, will prevent diagnostic mistakes from being made.

From what has been said in the foregoing remarks, it is evident that diphtheria complicated by arterial occlusion of the limbs is a serious affair. The prognosis *quoad vitam* is bad, since out of a total of sixteen cases in which the ultimate outcome is indicated, death occurred in seven, or 43 per cent. But it must be recalled that arterial occlusion is a complication belonging to the malignant types of diphtheria in which the organic intoxication is severe, profoundly involving the principal organs, the heart, liver, kidneys, nervous system and

the endocrine glands, particularly the suprarenals, as Netter has shown. It is one of the accidents belonging to the secondary syndrome of malignant diphtheria whose extreme gravity is at present so well understood.

As I have already pointed out and as I shall still insist farther on, occlusion of the arteries of the limbs is a consequence of cardiac thrombosis; it indicates or even reveals an important morbid change in the heart, both of its muscle and in some cases the endocardium. The patient dies from his heart lesions, not the complications.

When recovery takes place—57 per cent. of the cases—it is always at the cost of a more or less extensive loss of a limb; in these circumstances also, the prognosis is serious, since the affection always terminates in a mutilation which occasionally may be considerable and is never negligible. In nine cases where recovery took place it was necessary to amputate the limb above the knee, in one the entire foot was removed, in another the removal of the index and medius of the right hand was required, while in only two instances was surgical interference unnecessary. Yet in one of these the four last fingers of the right hand were contracted, giving rise to a "claw hand," interfering with the functions of the hand.

Unfortunately, serotherapy does not prevent this serious complication of diphtheria from arising. As I have already said, instances seem to be increasing of late years, rather than otherwise, because the serum prolongs the patient's life, so that the late complications are observed more frequently than before serotherapy was introduced.

Arterial occlusion in infectious diseases may be the consequence of two different pathogenic processes, namely, thrombus or embolus. In the former they result from a primary inflammation of the arterial walls in the form of an acute arteritis. In the latter they are caused by a migratory clot originating at a part distant from the site of the occlusion and which, in the great majority of cases, comes from the heart, more or less profoundly changed by the infectious disease.

In diphtheria, occlusion of the large arterial trunks of the limbs is the consequence of an embolus originating in the heart. Both clinical and anatomical arguments can be put forward in support of this pathogenesis. The former may be taken from the etiology and symptomatology.

From the etiological viewpoint, we have seen that occlusion of

the large arteries of the limbs occurs in the malignant types of diphtheria in which the intoxication has more particularly attacked the heart. Almost always it occurs only when the cardiac accidents have already been manifest for several days and have attained their maximum intensity.

The symptomatology also offers important arguments. The suddenness of the onset, the immediate intensity of the accidents indicating an absolute cessation of the circulation in a portion of a limb plead in favor of embolus. Nevertheless, it should be known that in some cases the clinical onset of an acute arteritis may be quite as brutal, the evolution of the lesion being at first latent and only manifesting itself at a time when complete occlusion of the lumen of the vessel has taken place. But an argument of considerable value is offered by the multiplicity of the occlusions: when arterial occlusion takes place simultaneously or successively in one or several limbs, in the brain, the lung, the spleen, kidneys or aorta, it is certain that they have been produced by multiple emboli. Acute arteritis of the large arterial trunks usually involves a single artery and are only exceptionally multiple. Pathological findings sustain what was presumed clinically.

Several observations in which death took place rapidly after the onset of the occlusion revealed at autopsy the characteristic lesions of arterial embolus. The vessel is occluded by a firm or even hard grayish clot, offering lighter colored striæ at certain spots, which can be compared to the lead of a pencil. The clot differs in shape from the lumen of the vessel. It is often surrounded by a redder and softer coagulation, having a spongy look; these are secondary coagulations which take place on the spot on account of the complete cessation of the flow of blood produced by the embolizing clot.

An important fact is that the clot nowhere adheres to the arterial lumen; the intima appears practically normal, although occasionally somewhat red on account of imbibition of blood, probably post-mortem in nature. Such lesions were found in two of the eighteen cases and are absolutely pathognomonic of embolus. For that matter, similar findings have been met with in arterial occlusion in diphtheria, of vessels other than those of the limbs, in particular the three cases reported by Marfan in his clinical lectures on diphtheria where the emboli occurred respectively in the lung, brain and aorta.

When the lesions have undergone an evolution of several weeks, their aspect is far less characteristic. A process of secondary arteritis will have developed from the irritation set up by the presence of the embolus. For this reason, the conditions found during surgical interferences leave some doubt as to the exact nature of the lesions and do not admit of settling the question as to whether the case was one of primary arteritis or arterial embolus, unless the data obtained at necropsies of subjects dying some hours or days after the appearance of the occlusion be taken into consideration. The perfect similarity of the conditions met with in both instances leads to the conclusion that in all these cases the pathogenic process governing the accidents of arterial occlusion are the same, namely, that they are the consequence of embolus.

These emboli originate in a cardiac thrombosis. The existence of a cardiac thrombosis in diphtheria has been an acquired fact for many years. Nevertheless, it is only right to say that this highly important notion became forgotten, the existence of cardiac thrombosis was not recognized and it was supposed that the clots so frequently found in the heart at autopsy of diphtheria cases were formed in the heart during agony or post-mortem. It was no longer remembered that some few cases of embolic accidents had been previously published, but in 1902, Marfan and his collaborators Daguy, Delot and B. Weil again drew the attention of the profession to the importance of cardiac thrombosis and the part played by it in the production of death in malignant diphtheria. They showed that the thrombosis is more apt to be seated at the apex of the heart, in either one or both ventricles. Although the clots have a cruoric aspect, although they are soft and less adherent and stratified than clots considered by most writers as being formed during the patient's life and although they represent an intermediary type between those formed during agony or post-mortem and those formed during life, this is due to the fact that death, usually taking place very soon after coagulation, does not give time to the clots to acquire the characters which can only belong to old clots. What completes the demonstration that these clots, which appear to have developed during agony, are in reality formed during life, are the emboli to which they give rise. The occurrence of emboli therefore offer considerable interest from the viewpoint of the general pathology of

diphtheria since they represent the only element of certainty as to the reality of cardiac thrombosis.

Several factors intervene in the production of cardiac thrombosis in diphtheria, but the part played by myocarditis is the most evident of all. When an autopsy is done in a case of malignant diphtheria complicated by cardiac thrombosis, important morbid changes of the cardiac muscle are invariably found. The cavities of the heart are dilated, the myocardium is soft and flabby, offering at certain spots, particularly in the ventricles and apex, decolorized areas occasionally of the dead leaf tint. Now, although the heart may seem to be little changed macroscopically, an histologic examination usually reveals lesions, three degrees of which can be distinguished, the first of which being a simple congestion with some hemorrhagic foci. The second degree, more accentuated than the first, presents parenchymatous lesions—degeneration of the cardiac fibres, hyperplasmic atrophy, proliferation of the muscle nuclei, etc. Finally, in the third degree to these lesions interstitial lesions become added—perimuscular leucocytic infiltrations, proliferation of connective tissue.

Besides the myocarditis, a place must be reserved for lesions of the endocardium formerly described by Bouchut and Labadie-Lagrave. These were denied to exist but Marfan and his collaborators have lately demonstrated their reality. The process is not a valvular endocarditis but a parietal endocarditis, in most instances limited to the cardiac apex in one or both ventricles. These lesions of apexial endocarditis are macroscopically manifest from the slightly granular state of the lining membrane of the heart and microscopically by a thickening of the endocardium whose epithelial cells are in a state of tumefaction and with this there is an infiltration of leucocytes. What well shows the part that it plays in the production of cardiac thrombosis, is that occasionally the clots are intimately adherent to the inflamed membrane to such an extent that they seem to form part of it.

Finally, a less important part must be attributed to the blood changes caused by the diphtheritic intoxications. Although the researches of the older chemists showed that it contained less fibrin, modern hæmatologic researches have established the fact that it contains a large quantity of polynuclear leucocytes whose destruction, if the blood should stagnate, may set free a large amount of fibro-ferment and thus favor coagulability of the blood in certain conditions.

All these factors intervene in the production of cardiac thrombosis. Under the influence of atony of the cardiac muscle—the consequence of the myocarditis—the blood stagnates in the dilated cavities of the ventricles. This blood, which no longer circulates and is profoundly changed in its composition, coagulates on contact with the roughened surface of the inflamed endocardium. We thus now understand the mechanism of the production of emboli in diphtheria, as well as that of cardiac thrombosis from which they originate.

It now remains to explain how occlusion of an arterial trunk of a limb by embolus gives rise to dry gangrene in children whose arterial system has generally preserved its perfect integrity.

When the principal artery of a limb is ligated in a young subject, gangrene never occurs. The collateral circulation becomes perfectly established in the neighboring vessels and is sufficient to assure the nutrition of the limb whose vitality is not interfered with in any way. Things take place differently when the occlusion is due to an embolus; when the child lives long enough a more or less important extent of the limb becomes the seat of gangrene. This is because secondary coagulations above the embolus as far as the first collateral take place when the blood comes in contact with the embolizing clot. Coagulation may also take place below the embolus. The considerable drop in the arterial pressure in diphtheria explains why these secondary coagulations are much more extensive than those which form near a surgical ligature; the blood, which, on account of the hypotension, circulates with difficulty in the arteries—although these are normal—stagnates when in contact with the obstacle offered by the embolizing clot and coagulates.

Still more, the hypotension explains the insufficiency of the collateral circulation, the arteries having remained patent become distended with greater difficulty when they are not stimulated sufficiently by the blood-pressure. For that matter, an inflammatory process soon develops from the contact with the coagulated blood; a secondary postembolic arteritis becomes declared resulting in adhesion of the clot which was at first free in the lumen of the vessel. Then the clot becomes organized.

Is occlusion of the arterial trunks of the limbs in diphtheria always due to embolus? Can it not sometimes be the consequence of a thrombosis arising on the spot in contact with a focus of endocarditis?

In a word, can diphtheria primarily attack the arteries and set up an acute arteritis? Some writers have invoked this pathogenesis in certain cases particularly for explaining arterial occlusion met with in the pulmonary and cerebral arteries.

Marfan admits that pulmonary thrombosis from arteritis is a possibility, but only exceptionally. Rolleston likewise thinks that certain foci of cerebral softening may be the consequence of an arteritis of the large arterial trunks of the base of the brain. Acute, subacute and chronic arteritis have been produced experimentally by the use of diphtheria toxin by both Thérise and Boisset; but the lesions produced were always localized to the aorta and never has the arteritis been observed in the limbs. Therefore, it will be seen that if primary diphtheritic arteritis is a possible occurrence it cannot as yet be considered as having been demonstrated. At any rate, its part in the production of occlusion of the arteries of the limbs seems to be absolutely *nil.*

There is still one more question to be considered. Cardiac thrombosis and the emboli which are the consequence, are they caused by the action of the toxins of diphtheria or, on the contrary, are they due to a superadded infection to diphtheria?

An important part has been attributed to secondary streptococcic infection in the production of malignant diphtheria. Sevestre, Martin, Barbier and Ulmann have shown that, besides hypertoxic malignant diphtheria caused only by the Klebs-Loeffler bacillus, there exists strepto-diphtherias, the most serious type of malignant diphtheria, due to the simultaneous evolution of a Klebs-Loeffler infection and a streptococcus infection. However, the presence of the streptococcus has never been discovered in the embolic clots of the arteries, so that the part played by streptococcic infection in their production has never been demonstrated. Since Marfan's publications there is a greater tendency to accord less importance to the streptococcus in the production of malignant diphtheria, which are now regarded as being above all due to a massive diphtheritic intoxication.

But besides the streptococcus, other microbic agents have appeared to play a part in certain epidemics of malignant diphtheria. Two of Marfan's collaborators, Deguy and Legris, found during life in the throat and blood, and in the viscera post-mortem, cocci usually grouped in the form of diplococci similar to Thiercelin's entercoccus, and which

they have carefully studied under the name of *diplococcus hemophilus perlucidus* and *diplococcus hemophilus albus.* They found these organisms in the intracardiac clots, in the portion nearest to the endocardium, as well as in the peripheral emboli following cardiac thrombosis. Auché has made the same observation. These writers consequently are of the opinion that endocarditis of the apex, the cardiac thrombosis and the emboli to which they give rise, are caused by these bacteria and therefore are not due directly to the action of Klebs-Loeffler bacillus but to that of the associated organisms.

These conclusions do not appear to me conclusive and they have not been confirmed by further researches. Other workers were unable to find the diplococci of Deguy and Legris in cases of diphtheria complicated with cardiac thrombosis, so that their pathogenic part in the process remains more than questionable. More research work is consequently necessary in order to distinbuish the respective part played by the Klebs-Loeffler bacillus and bacteria of secondary infections in the genesis of cardiac thrombosis and arterial emboli in diphtheria.

Our present therapeutic measures for combatting the effects of occlusion of the large arteries of the limbs are most imperfect to say the least. Therefore, everything possible must be done to prevent their occurrence. It is by the early detection of the diphtheria and at once resorting to an intensive serotherapeutic treatment that this result may be obtained. When the diphtheria declares itself with characters of malignancy, when it appears in the midst of an existing epidemic, when false membranes rapidly develop with a tendency to become confluent and to cover the pharynx and nasal fossæ, it is proper practice to inject large daily doses of antitoxic serum *without any delay,* and in older children to even resort to intravenous injections, if one has the certitude that they have never before been given a serum treatment and are consequently not in a state of anaphylaxis.

The injections should be repeated every day until the false membranes have been eliminated, that is to say, for a week to ten days. After this, if some disturbance still persists and especially if the prodromes of the secondary syndrome appear, notably an early paralysis of the velum, small doses of serum are to be injected every second day for at least two to three weeks until every symptom has disappeared.

By resorting to this intensive prolonged treatment, the disorders caused by the diphtheritic intoxication may be limited, the formation of cardiac thrombosis avoided and consequently emboli which are the consequence. Very often, unfortunately, in practice, the physician is not consulted until the third or fourth day of the diphtheria or even as late as a week after the onset of the symptoms, so that by this time the diphtheria toxins will have already exercised their ravages and the serum will be unable to prevent the development of complications. It cannot control the evolution of lesions which are already constituted before its exhibition. If the heart is already involved, the diphtheritic myocarditis and endocarditis continue their progress and the accidents to which they give rise will develop in spite of a treatment correctly carried out.

The classic treatment of these serious cardiac complications must not be neglected: absolute immobility, the application of a large ice-bag over the precardium, camphorated oil, strychnine or sparteine subcutaneously. The symptomatic treatment has its importance and may, by facilitating the functionating of the diseased heart, prevent to a certain extent the production of cardiac thrombosis.

Let us now consider what is to be done when arterial occlusion has taken place. Would it not be possible to have recourse to surgical interference, to expose the embolized vessel, incise it, and remove the clot, and then suture the vessel and thus prevent gangrene? The progress made in blood-vessel surgery brings up this question, but I shall not insist upon it, because so delicate an interference would require general anæsthesia, particularly so in children, and for this reason cannot be advised in profoundly toxic subjects, whose heart is seriously involved, as well as for other reasons which can be easily understood.

Therefore, a palliative medical treatment is about all that can be undertaken. The member must be immobilized in good position and enveloped in moist warm aseptic compresses in order to combat as far as possible the tendency to refrigeration and desiccation. Great attention must be given to prevent any secondary infection from occurring; if an area of inflammation appears it should be at once painted with tincture of iodine. Should blebs form, they are to be dressed with a bland antiseptic powder, such as zinc peroxide. Strong antiseptic solutions are to be avoided, especially carbolic and subli-

mate, because they injure the tissues and may favor the development of moist gangrene.

There is now a treatment which to my mind should always be employed; I refer to hot air. It was used in my personal case and appeared manifestly to favor the reëstablishment of the circulation in a large extent of the limb which appeared to be in a good way towards gangrene. Therefore, it should be resorted to at the onset of the accidents, before the development of gangrene, and continued even when the gangrene has appeared.

When the eschar has ceased to extend and the line of demarcation commences to form, it becomes necessary, in every case where the gangrene is not strictly confined to the superficial structures, to perform amputation in the area of mortification. In diphtheria cases this must often be postponed for some time and before operating, all the cardiac accidents must have disappeared completely, likewise the paralysis, and the patient's general health must be satisfactory.

If there is no fear of putrid infection it is always preferable to wait until the collateral circulation has fully developed before amputating, as sloughing of the flaps will be avoided. The choice of the method of amputation must depend upon the individual case, so that discussion of the various technic need not be considered.

THE CLINICAL TEACHING OF PULMONARY TUBERCULOSIS TO MEDICAL STUDENTS

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For many years it has been my task to teach the rudiments of pulmonary diseases, more particularly pulmonary tuberculosis, to students of the third and fourth year. As the time which can be devoted to any one special department of medicine in these busy years is necessarily limited, it is only the more obvious and plainer methods of diagnosis that can be considered, but much can be accomplished in inculcating right and sound principles of examination and in coördinating and interpreting symptoms and the physical signs, to which later can be added the further knowledge and skill which only long experience and practice can afford.

The third-year student comes to the study of the subject with a general knowledge of physical diagnosis, which he has received in the second year of his course and with a growing familiarity in the methods of diagnosis which he is all the time gaining in his other clinics in internal medicine and surgery which he has in the third year.

It is, of course, of vital importance that his training in physical diagnosis should be thorough, clear and free from the details and refinements which will come later, and which would only confuse him at this stage of the game.

In teaching in my own special department of pulmonary diseases, which consist mainly of pulmonary tuberculosis, it was formerly my habit to give an introductory course of didactic lectures to the third class upon the subject, but experience has taught me that such general exercises are of limited value and that the time can be more profitably spent in hospital clinics with small sections of students, where every student can do something himself and have pointed out to him on the living patient the conditions which he is to recognize, and have the difficulty he has in recognizing them explained to him and made clear. I have, therefore, abandoned the didactic lecture for the clini-

cal section teaching. In order that the student may, however, have an orderly brief knowledge of the fundamentals of pulmonary tuberculosis, I have prepared a small manual covering the whole subject, and this is placed in his hands and takes the place of the former didactic lectures upon the subject. By this means I believe time is saved and the subject is made more real and attractive by actual first-hand meeting and examining the patients in the clinic. There is nothing so fascinating and stimulating to the medical student as actually confronting the patient upon whom he is to make a diagnosis. He becomes the detective and the disease, or imagined disease, is the criminal which is to be hunted down through the intricacies of symptoms and physical signs. Moreover, there are many other things to learn in the actual dealing with patients which are very valuable in his future practice. He learns to judge of the mentality of the patient, the value of the subjective evidence, his psychology, and through the social worker or visiting nurse, who should always be present in the dispensary clinic, he learns about the environment and the economic and social conditions of the patient. If time permits, it is of value to send the student to the home of the patient, that he may study the conditions there as bearing upon the case.

My own special clinic at the Boston dispensary is only one of a large number of others in the same building, which embraces almost every specialty. The student consequently has the advantage of learning of other morbid conditions which may exist and which may have a bearing upon the pulmonary condition and aid in the diagnosis.

Naturally, all severely acute lung cases are in the hospital, and one does not, as a rule, meet with them in the ambulatory clinic except on the first visit for diagnosis and disposal.

The class is divided into sections of about seven students, who attend the clinic three days in the week for a month and then move on to another clinic of the same character. The clinic sessions last about two hours.

Besides the ambulatory dispensary clinics there is also one in a large municipal tuberculosis hospital, so that the students have an opportunity of seeing and examining this class of patients. I have also had the opportunity of sending sections to a state sanitorium not far from the city for instruction and observation.

When a patient, who is known or suspected of having some pulmonary trouble, comes into the clinic, the history, with the temperature, pulse, respiration and weight, is taken by the social worker or nurse. In this way time is saved, although when time permits, the student is also trained in taking histories. I then follow one of two methods. I either carefully review the history myself, bringing out the salient points, and then make a physical examination, calling attention to any deviations from the normal and their significance, and assure myself that each student by his own examination recognizes these abnormal conditions. Or, secondly, I first hand over the patient to a student with or without the history, and ask him to make his own diagnosis and examination and then have him report the result and his reasons therefor to me and the other students. I then examine the patient myself, and whatever mistakes and errors the student has made are pointed out and the diagnosis made, if it can be. The disposal of the patient is then considered, and whatever treatment is indicated is prescribed and the date set for the next visit of the patient to the clinic.

In the physical examination of patients I lay the most stress upon inspection, palpation and auscultation, although, of course, percussion receives due attention. The students are bidden to watch very carefully the movements of respiration, both as to the movements of the upper chest and of the diaphragm, to note whether there is any more depression on one side than the other and whether or not there is any lagging of one side. The tactile fremitus is also noted.

In percussion I have the student begin below and work up to the apices. In slight variations in resonance from the normal, differences of judgment are so frequent, and this is the case even with seasoned examiners, that I pay but small attention to these supposed variations. I often have the students tell me, however, that they find definite dulness over one portion or other of the lungs when no dulness exists, and then I make clear to them that definite dulness cannot exist unless there is something solid beneath, such as a pneumonic or a tuberculous consolidation or a tumor or fluid, and if there is no further evidence of such conditions, then their observation of dulness was an error in examination.

Indeed, whatever physical signs the student says he finds, I insist upon his translating into terms of pathology. For example, if he tells

me he finds bronchial breathing over any portion of the lungs I ask him what pathological conditions in the lungs causes bronchial breathing, and if the other symptoms and physical signs corroborate the diagnosis of this condition, and if not, then he is made to see that his observation is in error and he is shown wherein his error exists. For example, he is directed to place his stethoscope over the trachea or the upper cervical vertebræ or under the lobe of the ear and learn what bronchial breathing is and then compare it with the spot where he supposed he found bronchial breathing, and thus he is enabled to correct his error.

In my experience the student, even when he correctly detects abnormal physical signs, often seems unable to translate them into terms of the pathological condition which they indicate, and it seems to me of the utmost importance to impress upon him by repetition on repetition that the only value of physical signs is to indicate the underlying pathological condition.

In auscultation the teacher can only show the more definite and clearly marked signs. To try to determine slight modifications of respiration, often of doubtful determination with the experienced observer, is a work of refinement which can only usefully be employed later, but from the first the student must be taught to detect definite persisting râles, and the greatest stress in teaching auscultation must be laid upon their detection, and in doing so it must be emphatically impressed upon him that he must always have the patient cough. There must always be impressed upon the student the general proposition, which has few exceptions, that when râles occur at the apex they almost certainly mean pulmonary tuberculosis, and when at the base they almost certainly do not. When one can develop in the student a keen ear for the discovery of râles, so that he will not often miss them, he may feel pretty well satisfied with the result of his clinical teaching.

A finely attuned ear is of great value in percussion and auscultation, and I advise my students to embrace every opportunity to listen to good music; or, if they play upon any instrument or sing, to continue the practice.

Of course, the opportunity constantly occurs in the clinic for the auscultation of normal vesicular respiration and should always be taken advantage of. In my opinion the time can be more profitably

spent in doing this than in attempting to distinguish slight modifications of respiration or resonance. When there is marked consolidation from one cause or another the character of the respiration, namely bronchial, over such consolidation should be pointed out as well as the change in the voice sounds.

Not infrequently the student will report physical findings which will indicate grave and serious conditions, when the patient manifests no objective symptoms of any observable deterioration of health. The discrepancy between the student's physical findings and the patient's well-being is presented to the student and he is led to review his examination and find his error.

When sputum is obtainable the student should be given ample opportunity for its examination at the time when the case is under consideration. Hence every clinic should have its clinical laboratory where not only sputum examinations can be made but as well those of the urine and the blood. In clinics of this character something can be done in familiarizing the student with an X-ray picture of the chest, and this should be done in connection with the cases under consideration. It is helpful to always have a plate of the normal lung beside one of the abnormal, for comparison. At first only the clearly evident abnormalities as shown by the X-ray picture should be exhibited, as, for example, a pleuritic effusion or an extensive consolidation or infiltration. Later, if time permits, less obvious shadings can be studied. Much interest is excited in the study of a case if, after the findings have been made, an X-ray picture can be compared with those of the physical examination.

Not only pulmonary tuberculosis but other diseases of the lungs and pleura are met with in the clinic, which likewise afford useful material for study. For example, after the diagnosis of a pleuritic effusion has been made, the accuracy of the diagnosis can be tested by an exploratory puncture or aspiration. Various other non-tuberculous conditions of the lungs, such as abscess, emphysema, bronchitis, bronchiectasis, etc., appear in the clinic and afford valuable material for study.

At the close of the clinic the cases should be summed up and the lessons they teach emphasized and the students encouraged to read up on certain conditions or diseases met with in the day's clinic. Also, at the following clinic the student should be asked to give a brief

account of the cases seen at the previous one, and the especial interesting and instructive features of each case presented.

In all out-patient clinics many cases appear which give no evidence of disease or abnormality, and nothing is more useful in teaching students than such cases, for, as we all know, it is often more difficult to arrive at a negative diagnosis than a positive one, and it is a most excellent exercise to hand over to a student one of these normal chest cases and see what he will make out of it. If he thinks he finds evidence of disease, then is the opportunity to discover his ignorance of normal chest signs and to demonstrate them to him. In my opinion, every teaching clinic should constantly afford a certain number of normal chests for practice in negative diagnosis and in non-pathological variations, such as the difference, for example, in physical signs between the right and the left apex.

Such a clinic as I have briefly and quite inadequately described above can be made a thing of joy as well for the instructor as the student if conducted with enthusiasm and a love of the work. As I tell my students, each case is a problem to be solved like a Sherlock Holmes detective case, and one can enter upon the solution of the problem with all the zest that the detective does in solving his riddle.

You have an unknown personality with a real or imagined disease, and he is to reveal to you, with more or less truthfulness all the history or a partial one of his life. Out of the tangle of his story of past experience and present complaints, and the answers to your direct questions, you are to cull out and piece together the fragments into a consistent whole, pointing towards this or that possibility. To do this one needs keenness, logical thought, and deductive reasoning, and some previous knowledge of symptoms as relating to diseases of the chest. In the second place, by means of instrumental and other methods of examination, you are to test the function of respiration and if defective or abnormal, what causes the abnormality. To assist you, in addition, you have the clinical and X-ray laboratories. Finally, you have to correlate the symptoms and physical signs into one orderly whole and see if it reveals the solution of the problem. Viewed in this way, the solving of every case of suspected pulmonary disease or, for that matter, every medical case, becomes a mental exercise of the keenest pleasure.

INFLUENZA ON THE IRRIGATION PROJECTS OF THE RECLAMATION SERVICE

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Scattered throughout the arid and semi-arid regions of the West are some thirty irrigation projects of the United States Reclamation Service, comprising more or less compact areas of otherwise arid land which, through the constructive genius of the Service, have been made highly productive centres of agricultural development. World-famous dams store the life-giving water and divert it into literally thousands of miles of canals and laterals, whence it is carried to the waiting land to perform its part in helping to make the desert blossom like a rose. The location of these projects is shown on the accompanying map.

During the fall and winter of 1918 these projects, like practically every other locality in the United States, were visited by the epidemic of influenza, and it is believed that a brief statement concerning the epidemic as related to the projects and as seen from the standpoint of the officials of the Reclamation Service in charge of the projects may be of more than passing interest. The comments which follow are taken largely from the project histories for 1918, submitted within the last few months by the project managers of the respective projects.

The dates at which the epidemic first made its appearance vary from September 15, on the Sun River project in Montana, to " between Christmas and New Year's " on the Umatilla project in Oregon. October appears to be the most frequent month during which the epidemic first appeared.

Each project from which a report has been received noted cases of the diseases, but as the vital statistics given relate almost entirely to the employees of the Service only, it is not possible to present accurate figures concerning the number of cases or deaths occurring on the projects among the settlers. Twelve deaths occurred among the somewhat less than three thousand employees represented by the projects reporting. Influenza and pneumonia vaccines were used on several

projects, and various other prophylactic measures were employed to prevent the spread of the infection, such as isolation of those stricken with the disease and quarantine of new arrivals in a camp.

The accompanying table summarizes the data reported concerning the dates of occurrence of the epidemic and the number of cases and deaths among employees of the Service, and includes data regarding the average elevation above sea level of the irrigable area of each project and the range of temperature:

INFLUENZA EPIDEMIC, RECLAMATION SERVICE PROJECTS

State	Project	Elevation of irrigable area (feet)	Range of temperature (deg. F.)	Date of first occurrence of epidemic	Employees	
					No. of cases	No. of deaths
Arizona	Salt River	1,200	22–117			
Ariz., Cal.	Yuma	80–215	22–118	"Latter part of 1918"	Many	None
California	Orland	250	26–114			None
Colorado	Grand Valley	4,700	−15–100	October	33	1
Colorado	Uncompahgre	5,500	−25– 98	"Middle of October"	Many	2
Idaho	Boise	2,500	−28–111	"Late fall and winter"	Many	1
Idaho	King Hill	2,750	−17–111	October 16	Many	2
Idaho	Minidoka	4,223	−24–104	September	Many	None
Montana	Blackfeet (Indian)	3,850	−56–100			
Montana	Flathead (Indian)	3,000	−30– 96	October	19	1
Montana	Ft. Peck (Indian)	2,000	−40–100			
Montana	Huntley	3,000	−35–105	"In the fall"	Many	1
Montana	Milk River	2,200	−56–107		26	1
Montana	Sun River	3,700	−40–100	September 15	25	None
Mont., N. Dak.	Lower Yellowstone	1,900	−46–110	"About October 1"		None
Nebr., Wyo.	North Platte	4,100	−30–104			
Nevada	Newlands	4,000	−20–100			1
New Mexico	Carlsbad	3,100	− 7–110	"About October 1"	Many	None
N. Mex., Texas	Rio Grande	3,700	− 5–105	October 3	92	2
N. Dakota	N. Dak. pumping	1,900	−49–107			
Oregon	Umatilla	470	−28–115	"Between Christmas and New Year's"	None	None
Oreg., Cal.	Klamath	4,100	−10–100	"Latter part of September"	Many	None
S. Dakota	Belle Fourche	2,800	−38–103	November	Many	None
Utah	Strawberry Valley	4,600	−10– 95	October	3	None
Washington	Okanogan	1,000	−10–105		3	None
Washington	Yakima	1,000	−21–110	October	Many	None
Wyoming	Riverton (Indian)	5,200	−30–102			
Wyoming	Shoshone	4,500	−36–104		Many	None

Arizona-California, Yuma Project.—"A great many cases of influenza developed among the employees, but prompt medical attention and stringent sanitary regulations resulted in most of the cases being quite mild as compared with the seriousness of the disease elsewhere."

California, Orland Project.—"Only two cases of serious illness developed during the year, notwithstanding the influenza epidemic."

Colorado, Grand Valley Project.—"During October, November and December the influenza and pneumonia epidemic appeared, and the force was badly disorganized thereby. At one time four of the eight employees in the project office were indisposed and about the

same ratio extended to the field force. As far as known, death resulted in one case only. There were thirty-three cases. Prophylactic vaccination for influenza and pneumonia was administered to twenty-three persons."

Colorado, Uncompahgre Project.—"About the middle of October the influenza made an appearance and commenced to spread. A con-

PRINCIPAL IRRIGATION PROJECTS
IN THE WESTERN UNITED STATES

siderable number of employees were affected and two deaths occurred, on November 1 and December 2."

Idaho, Boise Project.—"No dangerous illnesses or general epidemics developed until late fall and winter, when the influenza attacked the various project communities. Many employees were stricken with the malady, though the majority of the cases were not severe and were not followed by pneumonia or other attendant complications. In a few instances, however, the cases were severe and one such case resulted in death on December 11. During the last two

days of December ten clerical and engineering employees of the project office were stricken with the disease."

Idaho, King Hill Project.—"The epidemic was rather slow in coming to the project, but made rapid progress after its arrival. The first case reported was on October 16. A quarantine was established on October 29, remaining in force until November 5, there being few cases at headquarters or in the camps at that time. A second epidemic occurred early in December and became so serious about the middle of the month that a second quarantine was established on December 16, which was still in force at the end of the year. Two deaths occurred, the cases apparently not being particularly severe.

"Quarantine was enforced very strictly as regards men entering camp, but men were permitted to leave camp in case they decided to quit work. It soon developed that the labor supply was running low, and it was necessary to bring men in. To prevent any possibility of these new men bringing in the disease they were placed in quarantine for three days before being taken to camp and were also examined by a physician. Since following this procedure there were no new cases of influenza, except in one instance where it is believed that quarantine had been broken without the knowledge of the camp superintendent."

Idaho, Minidoka Project.—"The influenza caused considerable inconvenience and expense, but no deaths occurred in the Reclamation Service organization from this cause. On the project, however, the disease caused many deaths. The epidemic began in September and was not under control at the end of the year. Conditions were made worse on account of the shortage of physicians, most of whom were in the army."

Montana, Flathead (Indian) Project.—"Beginning with the month of October, the influenza epidemic caused a considerable amount of sickness, with nineteen cases and one death among the employees. All preventive measures possible were taken to combat the disease, and it has not seriously interfered with the operations of the project."

Montana, Huntley Project.—"In the fall an epidemic of influenza swept over the project, causing a great deal of sickness among the employees and one death. At one time out of five employees only two were able to be at work. No preventive action was taken on account of the lack of knowledge of the disease."

Montana, Milk River Project.—"Immediate steps were taken to secure influenza antitoxine and to induce all employees and their families to take advantage of the inoculation, and the cases of the disease were kept at a minimum. Only two cases developed on the St. Mary storage unit and these were of a very mild nature. The remote location of this work and the inability to recruit much labor during the height of the epidemic probably accounts for the immunity from the plague. One hundred and fifty influenza vaccinations were administered to employees of the distribution unit. There were twenty-six cases and one death."

Montana, Sun River Project.—"When the epidemic of influenza was first reported in the newspapers, arrangements were made for the isolation of any cases that might develop, and stocks of necessary medicines and supplies were provided. For some time it was thought that the epidemic would be avoided, but a large number of cases finally developed. Results of vaccination were apparently good, although only one injection was given. As far as possible all cases were removed from the camps to a hospital at the earliest possible moment. There were twenty-five cases reported from September 15 to December 8."

Montana-North Dakota, Lower Yellowstone Project.—"The influenza epidemic struck the project about the 1st of October and began to take toll of Reclamation employees in November and December."

Nevada, Newlands Project.—"Influenza was the only epidemic which made its appearance, and this seemed to be in an unusually mild form. Only one death in the personnel resulted from this visitation, Mr. 'A,' who was stricken on November 10th. This later developed into pneumonia, causing his death on November 20th. No such practice as the wearing of masks was introduced, and schools and public gathering places were not closed."

New Mexico, Carlsbad Project.—"Influenza made its appearance on or about October 1st. Practically all labor was suspended, due to illness in nearly every family. The mortality was extremely high among the Mexican population, and the number of deaths, according to the records of a local undertaker, totaled thirty whites and seventy Mexicans. These figures, of course, principally relate to cases in which the undertaker's services were engaged, the prevailing practice of the Mexican population being to prepare their own caskets and bury their own dead."

New Mexico-Texas, Rio Grande Project.—" The epidemic of influenza greatly affected the entire project during its course. The epidemic began October 3rd with two cases and ran until December 1st. There were seventy-eight new cases in October, thirteen in November and one in December. The maximum number of new cases per day was reached on October 9th and again on October 17th with eight. The total number of cases was ninety-two. It resulted in two deaths of project employees."

Oregon, Umatilla Project.—" Until the last days of the year the general epidemic of influenza had not struck the Umatilla project, only a few isolated cases being reported among the settlers. Between Christmas and New Year's, however, the epidemic broke out in Hermiston and vicinity and in a short time one hundred cases were reported, whole families being stricken at the same time. The situation became so alarming that a community hospital was organized with two trained nurses in attendance, assisted by local help. Two deaths occurred. Up to December 31st none of the project employees had been stricken with the disease."

Oregon-California, Klamath Project.—" In the latter part of September the first wave of the influenza epidemic was discovered by the local Klamath Falls physicians. It is generally believed that a " drummer " brought the first case into the city. Every precaution was thereafter taken to prevent its spread. A local and temporary hospital was established, which was known locally as " Isolation Hospital," where incoming travelers were interned for a period of five days upon and after their arrival into the city, yet, in spite of all the extraordinary vigilance exercised by the local physicians, the disease continued to scatter. From the time of the appearance of the first case to the end of the year some thirty deaths had been reported in the county, all either directly or indirectly attributable to this disease. A great many of the employees of the Service were stricken with it, but none died."

South Dakota, Belle Fourche Project.—" Health conditions on the Belle Fourche project are always good, owing to the abundance of wind, sunshine and a dry exhilarating atmosphere. The only serious disturbance to the health of the project was the prevalence of influenza during November and December. This disease attacked probably 20 per cent. of all of the people of the district, and although not with such

serious results here as in many other localities, still the fatalities were large and numbered more people during its run than died from all other causes during the year."

Utah, Strawberry Valley Project.—"Influenza was prevalent in all cities and towns on the project in a virulent form during October, November and December. Many towns throughout the State were quarantined, and in December Utah County, in which all project offices are located, was quarantined. Project office employees, with three exceptions, were inoculated with Mulford's influenza serum at the outbreak of the epidemic. In all, ten employees were inoculated. Three cases of influenza occurred among these employees, one of whom had been inoculated and two had not."

Washington, Okanogan Project.—"Three cases of influenza occurred, 'B,' from October 25th to November 5th, and again from November 21st to December 7th; 'C,' from December 6th to 19th; and 'D,' through the most of December. No deaths occurred. The greatest care was taken to prevent the spread of the disease."

Washington, Yakima Project, Tieton Unit.—"Influenza was prevalent during the last three months of the year and measures put into effect by the county health officers were ineffective in preventing the spread of the disease."

Washington, Yakima Project, Storage Unit.—"A severe attack of influenza broke out in the camp in December; practically all the people left in the camp for the winter were afflicted. An experienced hospital orderly was secured as nurse to assist in the care of the patients, and the disease was brought under control with no serious complications or any deaths."

Wyoming, Shoshone Project.—"Only one case of influenza was very serious, but practically all employees required attention at various times, as it was deemed necessary to take all possible precautions."

The above comments, although naturally of a non-scientific nature, give a human-interest picture of the epidemic from the standpoint of the layman at widely separated points throughout the West, and probably delineate in a broadly generalized way conditions as they existed during the epidemic in that section of the country in 1918.

THE GASTRIC CRISES OF CEREBROSPINAL SYPHILIS * †

A STUDY WITH A DETAILED REPORT OF THREE CASES

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For the relief of double point spasm (as described in this paper), and particularly if gastric dilatation has taken place, *the writer wishes particularly to call attention* to a method which he has found useful. It is a mechanical manœuvre [89] and consists in the making of pressure by means of a bi-forked pressor instrument (devised by Abrams) over segmental areas of the spinal sympathetic nervous system. For the relief of acute dilatation of the stomach, if caused by double-point spasm with a resultant time in intrasegmental tension, a firm degree of pressure should be exerted for 30 to 60 seconds with the pressor instrument placed across the spinal column in the interspaces between the third and sixth thoracic vertebræ. Within a comparatively few seconds the patient will explosively begin to belch, as the cardia relaxes first, or a sudden rush of fluid or gaseous contents can be audibly or stethoscopically heard passing, ostensibly through the relaxed pylorus or duodenum into the jejunum, and simultaneously the sense of pressure fulness and the painful sensation of double fixed lump is relieved. Should there be gastric dilatation the area of gastric tympany rapidly becomes smaller. This manœuvre may have to be repeated several times before a successful result is obtained.

What is the mechanism of this treatment? The simultaneous cardio- and pylorospasm may be the result of a lawless or overstimulated vagus (a vagotony) which the inhibitory action of the thoracic sympathetic fibres to the stomach is powerless to overcome until mechanically stimulated by forced pressure.

The writer, with the coöperation of Dr. Willis F. Manges, took

* Read before the Section of the Practice of Medicine, at the meeting of the American Medical Association in New York City, in June, 1917.

† Concluded from Vol. 1, Series 30, page 71.

occasion to fluoroscopically examine the barium-shadowed stomach of a patient upon whom this mechanical pressure was being exerted over the dorsal spine, and we were unable to detect any change in the size, shape, position or peristaltic activity in the stomach during the test. This test subject, however, was a perfectly normal individual and perhaps such an examination repeated in a patient in a state of double cardiopylorospasm might record entirely different findings. At any rate, from a clinical standpoint, the use of the manœuvre has been successful and the writer *urges its further trial.*

If gastric dilatation is pronounced, in addition to the elevation of the foot of the bed and the other measures suggested, the patient should be placed in the right anterolateral abdominal position and a small bolster pillow should be put just below the lower border of the stomach to raise it to a higher level and prevent an aggravation of the condition by duodenal or mesenteric kinks or angulations.

These measures control the nausea, vomiting, hypersecretion, gut-spasm, gastric dilatation, and to some extent the pain. For really severe pain, such as emanates from the posterior dorsal nerve roots, nothing short of morphine has proven thoroughly satisfactory in the writer's hands. If the pain is moderate some of the drugs suggested above may control it.

The *circulation* should be carefully watched during the acute attack, and if the systolic blood-pressure falls below the pulse-rate the patient is in need of stimulation.

Feeding by mouth should not be resumed, until all nausea has ceased and the stomach becomes definitely retentive, and when begun should be furnished in liquid form, in small amounts, and in frequent feedings, gradually increasing as in the ulcer cure.[90]

In the meantime nourishment is to be supplied by rectal enemata and by the use of proctoclysis with 1 per cent. normal soda bicarbonate solution in which may be added 5 per cent. glucose, and if need be gms. 2.0 to 4.0 (grs. 30 to 60) of sodium bromide to allay restlessness and nervous apprehension.

When convalescence is established and the patient's hunger has returned, it is wise to remember Rosenheim's[91] caution not to overload the stomach on account of the danger of producing motor errors.

External application to the epigastrium of wet compresses, either hot or cold, give variable pain relief in the same individual; some-

times one will help, sometimes the other. Other forms of counter-irritation, such as the mustard plaster or fly blister, may be tried.

The Intercurrent Treatment Between Attacks.—The patient should be brought to and made to maintain the highest level of health. His diet should be simple and made compatible with his gastro-intestinal digestive chemistry and tolerance, but should be high caloric, containing an abundance of fats and oils, in the form of cream, butter, olive oil, bone-marrow, cod liver oil and malt (or maltine), cheese, etc., and a sufficient amount of proteins and carbohydrates. It has been truly said that a tabetic who is gaining in weight is doing well. The meals should be frequent and small. If during the acute attack gastric dilatation has occurred, during convalescence and for some time thereafter the patient should lie down on his right side for an hour after each principal meal, with the foot of the bed or couch elevated six to eight inches.

Any state of anæmia should be combatted—probably best by intramuscular injections of cacodylate of soda and citrate of iron in a dosage of gms. 0.06 (grs. 1) each and glycerophosphate of soda gms. 0.15. These may be given every other day, or Fowler's or Donovan's solution may be prescribed. All act as useful tonics.

Cardiac or vasomotor irregularities should be corrected. When due to an associated splanchnoptosia proper abdominal support should be provided. The writer has found the Curtis abdominal pad for men, and the Gossard corset for women, have given him the most satisfactory results.

It is important to mention the necessity of keeping the bowels open. Constipation is the rule, and in some cases can be a real menace to health and the harbinger of the gastric crises, allowing the accumulation and absorption of the toxic Beta ethylamines, to which Holmes attached great importance in initiating an attack. The dietary, therefore, should include stewed fruits, honey, treacle, figs, dates and whole wheat bread. Liquid petrolatum is most efficient. The agar preparations when impregnated with various laxatives, cascara, etc., are useful. Attention to habit formation in attending to the bowel toilet should be insisted on. Likewise, the use of proper abdominal exercises.

Where there are special indications for treatment to correct gastric symptoms, whether organic or functional, these should be carried out. For example, in one case the daily morning removal of the

fasting gastric residuum has done more than anything else to keep this patient in comfort, to forestall further critical attacks, and to build him up to a point where a pyloroplasty or gastrojejunostomy for pyloric ulcer can be performed with minimum risk. So, too, in a second case an operation for the correction of an organic duodenal lesion was carried out during the intercurrent period, after the patient had been properly built up, and the postoperative result has been most satisfactory.

During the intercurrent period attempts should be made to improve the local nutrition of the spinal cord. Counter-irritation in the form of dry cuppings, the cautery, galvanism, vibratory massage, etc., may be applied over the thoracic vertebræ. So, too, one may find help in the use of the high-pressure hose of alternating hot and cold douches to the spine. Exercises designed to stretch the spinal cord have been devised—the simplest, and perhaps as effective as any, being for the patient to lie flat on his back and with heels on floor raise his body to a sitting position, and conversely to keep his head on the floor and raise the heels so that the feet are at as acute an angle to the trunk as possible. Finally, the patient should *rest,* and rest physically and mentally, and as far as possible out of doors. Tabetics do best in summer and in a warm dry climate.

And now to mention briefly the *most important treatment* of the intercurrent period:

Antiluetic therapy should be pushed to a physiological tolerance. Upon this depends our greatest hopes of arresting the progress of the disease, and in this way preventing further attacks. Our entire syphilitic armamentarium should be engaged in this battle. The various forms of mercury with potassium iodide are effective in breaking down and storming the spirochætal fortifications and entrenchments, and the arsenical preparations, salvarsan and its allies, by intramuscular, intravenous and intraspinal attack, are our best fighting forces in the hand-to-hand death grapple with the enemy. These remedies should be given in courses, alternating with periods of mercury and the iodides, and with salvarsan.‡

All cases should be closely followed and treated until, and for

‡ The reader is referred to the very excellent articles on the treatment of syphilis by John A. Fordyce, and Homer F. Swift, in the *Am. Jour. Med. Sc.*, vol. clii, No. 4, Oct., 1916.

sometime after, all active symptoms and findings have been eliminated. Certainly until the spinal fluid cell count has been restored to normal, until the Wassermann reaction has become negative, and if possible, until the globulin excess, which is the last to clear up, has been reduced to normal.

The operative treatment has already been discussed and need not be recapitulated, except to warn once more against too hasty recourse to surgery, until the attacks are unbearable and all other measures have proved failures.

This is the writer's judgment, principally, because the operation at the present writing is not standardized, the mortality is high, because there are frequent relapses and postoperative complications, and especially because it concerns the treatment of only a symptom group and *not* the arrest of the disease.

REPORT OF CASES

Case I.—Mr. S., age thirty-two, occupation, manager. First came under medical observation in November, 1914, with the complaint of nausea, vomiting, constipation, strangulatory cough and easy fatigue. His family history is negative.

Past Medical History.—Practically all of the diseases of childhood, repeated attacks of influenza, a tendency to recurrent tonsillitis; an attack of typhoid fever in 1894. He was operated in 1905 for strangulated hernia and in 1906 for chronic appendicitis. About 1906 he contracted syphilis, which was notable for the mildness of the secondary symptoms, and which apparently responded to a very insufficient amount of treatment. Has been married about nine years, with no children for five years, when the first baby was born dead, and a second baby born a year or two later has been delicate, but gives a negative Wassermann reaction.

Present Illness.—Mr. S. has been going down hill in health for some months past with increasing symptoms referable to the gastrointestinal tract; he wakes every morning with nausea and extreme dizziness, and frequently vomits shortly after getting out of bed. Vomiting generally induced and chiefly bile-stained fluid and mucus; no food retention; he feels relieved then and able to dress. Associated with the morning nausea is a pain of a dull gnawing character, referred to the region of the navel, and sense of heaviness and weight in abdo-

men, which is relieved by belching or vomiting. His bowels are intermittently constipated followed by attacks of diarrhœa with passage of stools suggestive of mucous colitis; marked intestinal gas and tenesmus. If he is unable to empty his stomach by morning vomiting, after several days of such failure, and especially if constipated, he may have very sudden acute abdominal pain chiefly in the epigastrium, which radiates up to both pectoral regions and around costal margins into mid-back. This pain may vary from a comparatively mild to a most agonizing type; is generally promptly followed by vomiting, which is at first comparatively easy, involuntary and succeeded by very difficult retching and bringing up of small but repeated quantities of bile-stained very bitter fluid. These attacks last for a few days, disappear abruptly, after which he feels practically well. He has also a very severe paroxysmal strangulatory cough, which starts as a little tickling sensation, felt just below the suprasternal notch, which passes rapidly into a strangling cough which brings up nothing from the lungs, but often induces a little regurgitation from the stomach which seems to relieve the cough. During these seizures of coughing he is told that he turns very blue, that the veins in his neck and forehead swell and become prominent, and he feels as though his head would burst. He states that the paroxysmal coughing attacks (laryngeal crises) preceded the acute gastric seizures by a few months, although he has noticed lately that they have occurred together.

Physical Examination.—The essential findings in his physical examination are as follows: The pupils react to light and accommodation but are unequal in size, the right being considerably larger; the axillary glands are enlarged; the knee-jerks are absent on reinforcement; Romberg's sign definitely positive. His blood-pressure is low (systolic 112, diastolic 82). His heart is "tired" with myocardial irregularity of action and sounds of poor quality and tone; no murmurs. The right lung shows a suspicious area of percussion dulness at the right posterior apex and down to the third rib, where the breath sounds are distinctly bronchial and accompanied by dry crepitant râles.

The abdomen is negative except for a contracted transverse and sigmoidal colon and a left inguinal hernia for which he wears a truss.

Laboratory Examinations.—Blood Wassermann, negative; Hecht-

Weinberg reaction, negative; spinal fluid, sparkling clear; cell count, 22 per cm., chiefly lymphocytes; Wassermann reaction, 58 per cent. positive,[92] with 1 c.c. of spinal fluid; moderate globulin excess.

Blood count shows only a moderate secondary anæmia. White blood-cells normal.

Gastric analysis: a sixty-minute extraction of an Ewald breakfast recovered 150 c.c., 125 c.c. being grayish turbid filtrate and 24 c.c. of chymified bread crumbs, with a small amount of intimately mixed mucus. Free Hcl 50; combined Hcl 10; total acidity 65. Occult blood positive to benzidene and plus minus to guaiac. Peptic enzyme strongly positive and renninzymogen strongly positive in dilution 1–1200.

Examination of the stool of the type common to spastic constipation; occult blood positive to benzidene; fermentation test normal; sugar litmus agar cultures record the findings of the bacillus coli communior.

Diagnosis.—The diagnosis made was cerebrospinal syphilis, with involvement of the vagus and the posterior thoracic nerve roots, with laryngeal and gastric crises in the prætaxic stage of tabes.

Antiluetic treatment was immediately begun, as outlined above, and alcohol and tobacco forbidden.

Progress of Case.—December 11, 1914: Complaint of pain and tenderness over left tibia; examination shows a periostitis with inflammatory œdema.

February 18, 1915: Has been to a ball, dissipated, alcoholic excess, which precipitated an attack of gastric crises, which lasted approximately ten days.

March 25, 1915: Has developed a true polyneuritis, involving the superficial cutaneous branches of the left radial, median, musculospiral and circumflex nerves, with redness, elevation of surface temperature, superficial tenderness and itching; duration one week beginning first in the distribution of the radial nerve, and progressing up the arm; no tenderness over nerve roots.

March 31, 1915: A neuritis of the same distribution now involves the right arm.

April 15, 1915: All neuritis has disappeared.

November 11, 1915.—Has had a good summer; no attacks. For about two weeks he has had symptoms of spastic constipation with

a return of the morning nausea, empty stomach retching and vomiting of bile with relief. He belches considerable gas which he seems to think comes from the intestines; he complains of a sense of a "raw spot" under the margin of the left rib. Has begun to complain, too, of girdle pain, and examination shows a thoracic zone of hyperæsthesia in the distribution of the fifth to eighth dorsal nerves.

March 24, 1916: No acute attack since November. Has again been dissipating and has developed grippal symptoms during which the laryngeal crisis returned, and also symptoms of spastic constipation. Both relieved by tincture of belladonna.

March 29, 1916: First appearance of lightning pains in muscles of both legs and first appearance of bladder symptoms in loss of bladder sensation of fulness and with inability to void.

April 5, 1916: His bronchitis, following the grippe, progressed to a low-grade bronchopneumonia which was considered tuberculous. He was transferred to the hospital and made a very slow convalescence, and on May 5, 1916, just two days before his expected departure from the hospital, he suddenly developed loss of appetite, together with a visible restlessness (prodromes?). About 6 P.M. he became suddenly nauseated with nausea occurring in waves, kept under control by swallowing; he complained of a sense of a "lump" at the level of the xiphoid—a lump that he could neither get up nor down, but which was so relieved by lying flat on his abdomen that he went to sleep and awakened in the morning without nausea, but with a real fear of eating. He took no food except a cup of tea at 8 A.M., was promptly nauseated and began to vomit; at first the vomiting was quite easy but later was accompanied by violent retching, was practically continuous and soon became characteristic of biliary vomiting and later of fecal vomiting. His stomach became acutely dilated, and the dilatation could be mapped out to include the duodenum. This was partially relieved by elevation of the foot of the bed, by adopting the left lateral abdominal position, and by continuous gastroduodenal lavage. There was progressive prostration, nervousness and cardiac irritability which was somewhat controlled by injections of morphine. There soon appeared attacks of sudden acute collapse, ushered in by itching on the outside of the nostril (which was not satisfactorily relieved by scratching). A marked change in expression, a drawing down of the corners of the mouth (the sardonic grin), was followed

in a minute or two by very alarming cyanosis, which responded to stimulants and oxygen.

Several of these critical attacks were noted and all apparently occurred during sleep. That is, the patient would doze off into a very light slumber, would suddenly become cyanosed, lasting for a few seconds to a minute, and his pulse would become almost imperceptible. This state of circulatory collapse would respond to oxygen and to injections of stimulants, and the patient would suddenly rouse with a wild staring look, would become perfectly conscious and frequently, and voluntarily expressed the feeling that he had a sense of extreme intra-abdominal pressure and coincident with an audible escape of gas and fluid into the intestines he would feel "as though he were floating off into space" (apparently at the period of cyanosis), after which he would appear very greatly relieved both mentally and physically.

After close observation of several of these attacks (in addition to the possibility of cardiac crises) they seemed to be critical relaxations of spasms of certain segments of the gut, inasmuch as Mr. S. complained of a dull pressure pain felt just below the lower border of the dilated stomach, and anatomically approximating the junction of the second and third portion of the duodenum. This pressure pain was accompanied by a sensation of a spastic "lump" just below the level of the xiphoid, which he could neither get up or down until it would suddenly relax at the original point and would seem to be passed downward into successive portions of the gut, likewise giving rise to painful pressure sensations at these points until it passed off with audible rumbling. During the more severe of these attacks there was marked evidence of gastric tetany, which was ushered in by a sense of pins and needles, and a tingling first in the tips of the fingers, which progressed up the hands and arms to just above the elbows. This sensation gradually increased to a spastic tonic contraction of the fingers, which were held in rigid extension and the thumbs were abducted and partially flexed, of such a degree as not to permit of forcible straightening. These tetanic spasms varied in length of time but averaged about five minutes. Associated with this was a sensation of contraction of the muscles, particularly of the face, giving rise to a sensation of "drawing" about the corners of the mouth. Trousseau's and Chvostek's signs could be elicited.

When matters were at their worst no single measure proved so effective for the relief of the gastric and high intestinal dilatation as the mechanical pressure made by the bi-forked pressor instrument applied in the interspaces between the third and sixth dorsal vertebræ. During this series of attacks the laboratory findings of a severe acidosis were obtained, which rapidly responded to alkaline medication by proctoclysis.

Mr. S. finally recovered and was discharged from the hospital in July, 1916, and during the summer of 1916 the intercurrent treatment was successfully pushed, and he gained fourteen pounds in weight and was able to play a few holes of golf.

October 7, 1916: He developed a neuritis involving the terminal distribution of the sciatic nerve of the left leg, with a localized tender point over the left gluteal region. This could not be controlled until his leg had been immobilized in a splint from foot to hip and injections of hot sterile salt solution and alcohol had been given over the sciatic nerve. The zone of thoracic hyperæsthesia has not changed to hypoæsthesia.

December, 1916: An attack of gastric crises, similar to previous attacks but not quite so severe. This attack was accompanied by hæmatemesis.

Following this attack the plan of emptying his fasting stomach each morning was begun and the Charts No. I, II and III show the curves obtained during March and April and the evidence of gastric erosion or ulceration, which was confirmed by Doctor Manges' X-ray examination in March, 1917:

March 28, 1917: The fractional gastric analysis (cf. Chart IV) is practically normal, except for a moderate hyperchlorhydria and the presence of occult bleeding. He now complains of vertigo and ringing in the ears, especially the left (a sea-shell sound), which suggests a lesion of the eighth cranial nerve. He continues to have intermittent attacks of spastic constipation, which seems to precipitate attacks suggesting intestinal crises.

The thoracic hyperæsthesia now shows complete anæsthesia, May, 1917. This patient has now gained twenty pounds in a year, which is approximately his best weight. The gastric crises have been absent for nearly six months, and this augurs well in view of the gradual change from thoracic hyperæsthesia to anæsthesia, and may mean that the progress of the disease has destroyed the sensory paths.

January, 1920: This patient, whom I had the opportunity of observing and treating for three years, on my departure for France placed himself under the care of another doctor, to whom I am indebted for the statement of his present condition.

The disease appears to have been gradually progressive, notwithstanding a rather large amount of active luetic treatment, consisting of mercury, iodides, and arsenic by intravenous and intraspinal injections. The patient has not been coöperative. He has continued to smoke and use alcoholic drinks. The direct treatment, although fairly large, has not been as frequently given as the physician in charge would wish to give. During 1919 after a series of three intraspinal injections of salvarsanized serum, after spinal drainage, the patient had *no* crises for eight months. During the last four months he has had three attacks of acute gastric crises, in which the symptoms of the laryngeal and cardiac crises can also be differentiated.

He has recently been thought to show some mental changes of melancholia and depression. I have not been able to learn the present or recent state of his blood or spinal fluid tests, especially the colloidal gold curve. This would be most useful to know.

Between attacks, the patient is well enough to play 18 to 36 holes of golf without undue fatigue, although in other ways he is distinctly asthenic. He has no ataxic symptoms. I am not convinced that his case is hopeless provided he would give his full coöperation.

Case II.—Mrs. Z. Mrs. Z. was sent to me on Dec. 26, 1916, by Dr. Harry D. Williams, of Trenton, N. J., for attacks of vomiting.

Patient is forty-eight years old, of excellent habits, and with a practically negative past medical history.

Her family history is extremely bad—father died at the age of seventy-two after three years of invalidism, following a paralytic stroke; her mother dropped dead of apoplexy at sixty-five; both of the paternal grandparents died of paralysis, and both of the maternal grandparents died of apoplexy, although none before sixty. One sister has had four miscarriages, and two brothers have vomiting attacks similar to hers. She has been married fifteen years and has never been pregnant.

Present Illness.—Mrs. Z. has vomited at irregular intervals since she was a child, but the attacks of vomiting began to annoy her especially about nine years ago; this vomiting came on about once or twice

a week and continued so until last summer, when they became less frequent, but where they formerly lasted only a few hours they may now last for several days. The vomiting is always bile-stained and bears no relation to food taking. At times it is apparently causeless, very easy and almost always involuntary; preceded by neither nausea nor pain; at times the vomiting is preceded by severe occipital or frontal headaches, which later give rise to nausea; she has three distinct groups of symptoms: (1) The vomiting as described above. (2) Severe attacks of postprandial epigastric pressure distress with a sense of a painful epigastric lump one or two hours after meals. This sensation may become progressively overwhelming and accompanied by cardialgia and palpitation, which continues until she has a sudden explosion of belching, which relieves all symptoms. During these attacks she rarely vomits, and if she does, vomiting must be induced. At such times she is afraid to eat "because everything I eat turns to gas."

These acute attacks are ushered in by a premonitory sense of depression; she becomes excessively nervous and cries at the least provocation. These attacks are followed by a considerable degree of prostration.

(3) Coming independently, or at times associated with either of the other two types, she may have intermittent attacks of intense colicky pains in the mid- and lower abdomen, which she describes as "agonizing," but which relax as suddenly as they appear with explosive flatulency, or the passage of jelly-like yellow or black masses of mucus from the bowel, after which she goes into a dripping perspiration. She states that on one occasion she vomited a large amount of dark brownish material.

In addition to these symptoms she has noticed for the past six months a certain difficulty in locomotion; she is uncertain in her gait and says she cannot walk a "path." She has had several bad falls on getting out of street cars, or on going up or coming down stairs. She has apparently loss of her power of coördination, for in stepping from a street car she usually steps too near and scrapes the back of her ankles on the steps; at other times when she feels perfectly well she can walk as straight as anyone.

Physical Examination.—On physical examination she is found to be moderately over-weight, with slightly hardened arteries, and with

a systolic blood-pressure of 158 and a diastolic of 88; her pupils are equal but react somewhat sluggishly to both light and accommodation; her knee-jerks are absent even on reinforcement; Romberg sign is positive; no ankle clonus; Babinski's sign negative; she shows no adenopathy; the examination of her lungs, heart and abdomen is practically negative.

Laboratory Examination.—Blood Wassermann, negative; Hecht-Weinberg reaction, negative; spinal fluid, 10 c.c. of opalescent fluid removed under slightly increased pressure. Cell count 25 to a cu. mm., with 80 per cent. lymphocytes; marked globulin excess. Spinal fluid Wassermann reaction 70 per cent. positive in 1 c.c.[92]

Her blood count shows a moderate secondary anæmia with a normal leucocyte count. The cholesterol content of the blood gives a reading of 320 mg. for each 100 c.c.

Functional kidney test with phenolsulphonephthalein gives a normal appearance of the drug (58 per cent. being eliminated in one hour with 170 c.c. of urine, and 26 per cent. eliminated the next hour with 90 c.c. of urine).

Analysis of stool for occult bleeding is negative.

The fractional gastric analysis made while the patient was in good health (*i.e.,* complaining of no symptoms) gives a chart of delayed digestion, first hour subacidity, catarrhal gastritis with duodenal regurgitation and suggests somewhat duodenal ulcer (cf. Chart V). The provisional diagnosis made was a cerebrospinal syphilis of congenital origin, with gastric and intestinal crises associated with a gastroduodenal lesion.

Progress of Case.—Mrs. Z. was admitted to the Methodist Episcopal Hospital on January 4, 1917; was given absolute bed-rest and constant cold Priesnitz bandages; she was quite willing and even desirous to rest quietly in bed. She was given daily intramuscular injections of soluble mercurial salts and increasing amounts of potassium iodide. She showed no return of symptoms until January 12, when she began to feel nervous and depressed and voluntarily stated that an attack was impending.

A fractional gastric analysis was carried out at this time (cf. Chart VI) and affords an interesting comparison with her first examination (cf. Chart V).

The prodromal nervousness progressed during the afternoon and

was followed by a vague upper abdominal discomfort, partially relieved by belching. The following morning she awoke with a violent headache, chiefly right supra-orbital, and was nauseated. She refused her breakfast tray, except a cup of tea, which was promptly vomited. Shortly after she began to have an increasing sense of upper abdominal pressure as though a lump were in the epigastrium which she could neither get up nor down, but was partially relieved by belching. This sensation became worse and was accompanied by waves of nausea and dry retching which would end with explosive belching and the regurgitation of a very bitter yellowish fluid in small mouthfuls. When seen by me about four hours later this attack had reached its height and Mrs. Z. was excessively nervous, depressed, in tears, and greatly fatigued from continual retching; she complained of epigastric pain, but showed no abdominal rigidity or localized point of tenderness. Her stomach was greatly dilated both to left and right, the area of gastric tympany to tuning fork percussion extended well over to the gall-bladder region and the percussion tone was referred through the liver.

The house resident tried numerous remedies for the relief of this attack without any effect, including cerium oxalate, antacid combinations and aromatic spirits of ammonia. The bi-forked pressor instrument was applied between the third and fourth dorsal vertebræ for sixty seconds and repeated three times, with intervals of one minute, and a few seconds later there was a tremendous series of the most explosive belching, which was followed by immediate symptomatic relief, the patient's drawn expression changed; her depression improved, she smiled and said, "I feel so much better." This ended the attack. Nevertheless, a duodenal tube was passed into the stomach and 50 c.c. of a peacock green blue fluid was withdrawn by the syringe. This fluid contained a mucoid sediment and flocculent blood-flecked particles. It gave a strong reaction for bile; a moderate reaction for occult blood. Free hydrochloric acid, 57; combined Hcl, 20; total acidity, 90. Amylase and lipase negative.

The stomach was washed by the syringe method with a solution of one-tenth normal soda bicarbonate and the tube was connected up with an outflow pail for continuous drainage. The tube was retained in the stomach for nine hours, during which time it drained

240 c.c. of a greenish yellow mucoid fluid, at the following hourly drainage rate:

2 to	3 P.M.	15 cc.
4 to	5 P.M.	7 cc.
6 to	7 P.M.	26 cc.
8 to	9 P.M.	112 cc.
10 to	11 P.M.	80 cc.

The next day Mrs. Z. felt quite well again, but a surgical conference with Dr. George G. Ross resulted in a decision to do an exploratory laparotomy for suspected duodenal ulcer.

January 17, 1917: Operation: upper right rectus incision; gall-bladder slightly distended and rather tense, but empties readily on pressure. No stones in gall-bladder or in duct. No adhesions to gall-bladder. Edge of liver sharp, and contains several macroscopic areas of connective-tissue scarring; pancreas normal. The stomach was considerably dilated; the pyloric ring was completely relaxed and the first portion of the duodenum was so much dilated as to make it appear part of the stomach. This dilatation passed into the second portion of the duodenum, at which point there was an annular scar from a healing ulcer. A posterior gastro-enterostomy was done with a double plication of the gastroduodenal limb. The appendix was retrocæcal, the tip pointing toward the gall-bladder; it was five inches long, swollen and under tension at the distal inch. The appendix was removed.

March 1, 1917: Mrs. Z. made an uneventful surgical recovery, and left the hospital to continue her antiluetic treatment at home.

April 11, 1917: Since her operation she has had no acute attack, or any of the symptoms of which she complained. Furthermore, she has had no difficulty in walking; can walk up and down stairs in the dark; she has no dizziness or nausea. Her knee-jerks were very good on reinforcement and quite perceptible without, and to-day shows no evidence of a positive Romberg.

A third fractional gastric analysis (cf. Chart VII) continued for seventy-five minutes shows a subacidity rather than the hyperacidity previously noted, and three hours after a meal of creamed chipped beef, bread and cocoa, aspiration recovered a small amount of well-digested chyme with free hydrochloric acid 20, and total acidity 30. Occult blood, negative.

May 14, 1917: Reports herself as feeling splendidly well with no recurrence of any attacks to date.

This case will be closely followed and reported on later. It does not seem possible that the visceral crises will be permanently controlled. However, this case illustrated the importance of correcting any organic surgical lesion as a first step in getting certain of these cases well.

January, 1920: This patient has had complete relief from all the old symptoms. Has had no further attacks such as recorded above. She had one slight attack of vomiting following a distinct dietetic indiscretion in September, 1918, but has had no attack even remotely suggesting a gastric crisis. No leg pains. Has had an occasional neuralgic headache relieved by hot water bottle. She says she sleeps like a child, and doesn't know what nerves are any more; she can "walk a path" and has no spells of depression as she used to have. She has really made a wonderful improvement and now weighs 155 pounds.

Physical and Technical Examinations: Pupils give sharp reaction to light and accommodation and are equal. Knee jerks are sluggish, but present without reinforcement. Romberg sign absent. Equilibrium and gait normal. Blood-presure 152-90. Blood Wassermann negative. Hecht-Weinberg negative. Spinal fluid Wassermann negative. Cell count 8 per cu. mm. Colloidal gold curve normal. Globulin, trace. She appears to be a cured case, but is still continuing her active and general treatment.

Case III.—Mr. O. S.; age forty-six years; occupation, carpenter. This patient was referred on March 14, 1916, by Dr. Harry E. Wiley and Dr. Geo. G. Ross, with the complaint of intermittent attacks of nausea, vomiting and upper abdominal pain.

His mother died of Bright's disease, otherwise his family history is unimportant.

Aside from typhoid fever at the age of twelve his past medical history is unimportant.

He contracted a primary genital lesion twenty-eight years ago, but disclaims all knowledge of any secondary symptoms. He has been married sixteen years, but has had no children.

He has been in good health until three years ago when he had his first attack; this and all subsequent attacks have consisted of sudden

abdominal distress; coming without apparent cause, and ushered in by a sense of epigastric discomfort. This is followed by nausea and vomiting and epigastric discomfort, increasing to very intense pain, which at times is colicky in character and at times continuous, agonizing, lasting several hours and gradually wearing off during the next two or three days. Has generalized abdominal soreness after these attacks, but no points of tenderness. The pain is localized in the mid-epigastrium and is not referred, although once it began in the mid-back, radiated around the left costal margin to centre in the epigastrium. After the acute attack the stomach remains upset for several days. "Milk especially curdles" in his stomach, and for several days after an attack he has a dead feeling in his genitalia and passes less urine. Between attacks he finds no bladder difficulty, but says "he can hold his water all day long without feeling a full bladder," nor does he have any gastric or intestinal indigestion. He has no disturbances of locomotion or lightning pains, although he has noticed occasional diplopia and dizziness. He is just at the end of his last attack, which began five days ago and he is still in pain.

Physical Examination.—The patient looks ill with the anæmic pallor suggestive of nephritis or syphilis. His hair shows early alopecia; he has a definite Argyl-Robertson pupil and the pupils are irregular in outline, the left one having an ovality which points upward and outward. There is no adenopathy and no Romberg, and the deep reflexes are all exaggerated; there is no evidence of a thoracic zone of hyper- or hypoæsthesia. His lungs are clear throughout; the heart is rapid, running between 85 and 95, with slight myocardial irregularity, poor tone, soft muffled sound; no murmurs. The abdomen is negative except for diffuse epigastric soreness.

Laboratory Examination.—Blood Wassermann, negative; Hecht-Weinberg reaction, negative; spinal fluid, 5 c.c., sparkling clear, cell count, 64 cells per cu. mm., lymphocytes predominating; moderate globulin excess. Spinal fluid Wassermann reaction, 100 per cent. positive ^{92} with 1 c.c. of fluid.

Fractional gastric analysis, March 15, 1917 (cf. Chart VIII), made during the attack, shows a slight motor delay to Ewald test breakfast; a subacid first-hour phase and a hyperacid second- and third-hour phase, reaching normal at 200 minutes. The diagnostic

opinion given was gastric crises of cerebrospinal syphilis, and the patient was returned to Doctor Wiley for treatment.

One year later, April 15, 1917, this patient was asked to return for further gastric analysis, and he gives this additional history. He has had two attacks during the year, one was a mild attack of two days' duration eight months ago, and the second was more severe, lasting eight days, from December 25 to January 2. Both of these attacks began without apparent cause and both were ushered in by prodromal symptoms of irritability, nervousness and marked diplopia for several days before the attack.

Preceding the more severe attack he had a series of hard chills. Aside from the prodromes in each case he went to bed feeling well and awakened in the morning with nausea, and after getting out of bed began to vomit a slimy mucus, and soon afterwards a bitter yellow fluid. The retching and straining became severe; he says he may vomit a dozen times in a day, and the total amount of bile may reach two quarts. He has never noticed hæmatemesis or a brownish tinge to the vomitus. The pain may either precede or follow the vomiting and in the last attack was felt first in the epigastrium, radiated up toward the heart and around the left costal margin, to be felt in the back at the posterior border of the ribs. The pain may be either intermittent or continuous and has needed morphine for its control. He has no lightning pains; no abnormalities of gait; no difficulty in walking in the dark. He has had less referred sensation to the genitalia and bladder in these last two attacks, although he still notices that he can hold his water for a long time. During these last two attacks he had a sense of a double retrosternal and gastric lump, which disappear if he can belch freely; his bowels were a little loose, but presented nothing to suggest intestinal crises.

January, 1920: Dr. Wiley, to whom this patient was returned for treatment, states that Mr. O. S. is still living and in fairly good condition. His gastric crises have been less frequent and less severe. The last attack was about one month ago. He has continued antiluetic treatment, although too intermittently, since October, 1916. Dr. Wiley states that his patient refuses to give his full coöperation in regard to being properly treated.

As to this patient's general physical and technical state of health I have no personal knowledge beyond the notes recorded in April, 1917.

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Industrial Medicine

INDUSTRIAL SURGICAL CLINICS

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PREFACE

The objects of these clinics are: First, to call attention to the diagnosis and treatment of various surgical conditions which occur in industry as a result of accidents. Second, to bring out the methods of treatment which minimize the results of the injury and lessen the loss of time to the individual and the industry. Third, to call attention to some of the fallacies of our past surgical teachings as related to the first two points. For example, surgical teaching has impressed upon all of us that conservatism is of the utmost importance, especially in amputations and the like. It is brought out clearly and frequently that conservatism in the severing of seriously injured members is fallacy, inasmuch as a poor stump causes not only the loss of use of that member, as figured in the various compensation acts, but it also involves a large loss of time and a consequent great expense when it is not properly done at the first sitting. Fourth, the effect of intercurrent diseases on injuries and the prolongation of disabilities on account of these will also be pointed out and attention given to methods of examination to determine the ways to correct these disabilities. Fifth, compensation acts provide that if a man has a disability when he is originally employed, and through injury this disability is made worse and the individual incapacitated, in spite of the fact that the condition existed previous to the accident, the employer must pay for the total disability; and the examination of employees will be con-

sidered in the following pages from time to time, with a view of pointing out ways of placing individuals with certain disabilities where they will be more protected, and the results of not properly placing individuals with certain disabilities, brought to attention in specific instances. Sixth, to detail the methods of diagnosis that have given us the best results in the detection of malingerers. Seventh, especial attention will be given to corrective surgery, *i.e.*, the methods that are used in our clinic to remedy those defects produced normally in the course of treatment or by poor treatment. Eighth, our object will be to illustrate these clinics with X-ray plates and other views not ordinarily seen in text-books, for it is believed that far more can be learned from one picture than from a page of printed material. Ninth, to describe the reconstructive methods used in our clinic to continue and complete the medical-surgical treatment of injuries to restore the disabled individual to the greatest future use. Tenth, medico-legal questions affecting surgical injuries will also be considered.

One of the authors, while still an assistant of Dr. John B. Murphy, of Chicago, engaged in industrial work and continued this work for nine years, doing the work of the Union Stock Yards Company, the Junction Railway Company, and acted first as Assistant Chief Surgeon, under Dr. S. C. Plummer, Chief Surgeon of the Chicago, Rock Island and Pacific Railroad, and then as Chief Surgeon of the Chicago and Alton Railroad, both large trunk lines. During this time he naturally came in contact with a very large number of accident cases as well as learning the psychology of the injured employee; and it was while gaining this experience that he began to appreciate that industrial surgery was a specialty in itself, and that many things entered into this line of work which did not enter into the private practice of surgery as usually engaged in. It was found during these years of experience that the usual antagonism between the employees and the company doctor was largely due to the fact that the doctor allowed himself to be drawn into the adjustment of claims instead of confining his attentions purely to the treatment of the disabled employee, thereby making the injured individual feel that the doctor was representing the company and was a natural enemy, rather than making him feel that the doctor was his friend and adviser and was not interested in the least in the settlement of the claim except to restore him to as near normal as possible, reducing the disability and letting the claim take care of itself.

Since returning from service in the Army Medical Corps he has been Medical Director of the Illinois Industrial Commission where a large number of cases from all sorts of industries are examined every week and where it was possible to compare the difference in results gained by the various forms of treatment, physically and psychologically; and it was because of this possibility of making comparisons that it was felt that there was a large number of cases and a large amount of experience going to waste, except so far as the authors were concerned, and it was decided to publish these clinics in this form. The cases from the Industrial Commission are published with the consent of the Commissioners in the belief that this knowledge will be beneficial to employees, employers, and industrial surgeons.

The other author has recently resigned from the Regular Army Medical Corps after nine years of service to engage in general industrial surgery in Chicago, and it was through the impression which examinations at the Industrial Commission made upon him that he urged the publishing of at least part of the material which he saw here, so that attention might be called to the divergence in the many cases between the things that we had all been taught and which were in the text-books, and how these things work out in actual practice.

From these two viewpoints it has been brought to the attention of the authors that industrial surgery is a specialty in itself—a combination of general surgery, orthopædic surgery, medical diagnosis, physio-therapy, electro-therapy, preventive surgery and general reconstruction surgery. It is to group these things and call attention of the medical profession engaged in this line of work, to certain things which apparently are overlooked in a very considerable number of cases that these clinics are presented.

It is known that these clinics will be of value to physicians engaged in industrial surgery, and it is believed they will be of value to physicians doing general surgery and medicine, as the accidents and disease met in industry are also seen in daily practice. Nearly all of the medical schools are now teaching industrial surgery and medicine—so it is hoped that these clinics will be an aid to the medical student.

From time to time the reports of specialists on examination of the various conditions not covered in the field of surgery will be taken up and treated by these specialists from the standpoint of diagnosis and treatment.

CHRONIC MONARTHRITIS—CAUSED BY INJURY, BUT PROLONGED BY INTERCURRENT INFECTION

T. G., male, aged nineteen; occupation, coal miner.

History of Present Condition.—This patient was working in a coal mine, February 18, 1919, and while pushing a car uphill stepped on a loose stone, twisting his left ankle. He had a sharp pain through the ankle-joint for about thirty minutes and could not work. After this he started to work and continued to work for four days. Each day the ankle gave him more pain than the day previous. On the fifth day he could not return to work, because his ankle was swollen, red and hot, causing him great pain. He has not worked since that date on account of the pain in the ankle.

Previous History.—He had "grippe" seven years ago. His throat has been sore occasionally, but he says these attacks have not been severe. His ingrown toenails have only been noticed by him for the last four months. His record with his employers show that he has not been in the habit of losing time on account of sickness.

Physical Examination.—On January 20, 1920, this examination showed a normal, healthy appearing young man, who was walking on crutches, with the left knee bent and keeping the weight of the body from the left foot. The left foot was in plantar flexion at about an angle of sixty degrees to the horizontal. It was impossible to flex the foot to a right angle, there being only about fifteen degrees of motion. There was fluid in the ankle-joint, as demonstrated by the swelling and fluctuation. Pressure on the heel upwards gave him pain, without any motion of the joint. The pain was located mainly at two points: one, across the front of the ankle from the internal malleolus to the external malleolus, and two, behind the internal malleolus. Pressure upward on the toes gave a marked reaction to pain.

Examination of the Teeth and Tonsils.—All cases of this character in our clinic are routinely examined for infected teeth and tonsils. The examination of the teeth in this patient showed that they were in excellent condition, except for the lack of care in brushing. In these cases the teeth are likewise routinely X-rayed, and this case illustrates the importance of this, even with negative findings, on gross examination. The X-ray showed the left lower first molar with an alveolar abscess, with much pus and destruction of bone. The tonsils were hypertrophied with crypts filled with detritus. The fauces were red and inflamed. The upper anterior cervical glands were somewhat enlarged and tender on both sides.

Examination of the heart, lungs and abdomen demonstrated no abnormalities.

On the infected foot there was found an ingrown toenail on the great toe, with an acute inflammation around the inner margin, the toe being tender and swollen. Some pus could be expressed from around the nail.

X-ray of the left ankle-joint showed no pathology in the joint.

Laboratory Examinations.—Urine was normal, except for an occasional white blood cell. Blood count showed 4,800,000 red cells, 10,800 leukocytes and 95 per cent. hæmoglobin.

Treatment.—Patient was admitted to the hospital on January 15. The infected tooth was removed and the bone was curetted on the 20th. The tonsils were removed on the 25th. At the same time the ingrown nail was removed, the matrix cauterized with the Paquelin Cautery and a wet boric-acid dressing applied. A plaster cast was applied to the ankle with the front cut out, and dry heat applied for one-half hour three times a day, through the window in the cast.

Method used for the application of dry heat: In our clinic dry heat is applied with a lamp made by an ordinary electric shop as follows: An ordinary metal lamp shade, a Benjamin three-way plug and three 100 c.p. carbon filament lights. This is suspended six or eight inches over the part to be treated and a heavy towel or sheet in the form of a tent pinned around the shade. This confines the heat to the location where it is needed. This simple apparatus has all the advantages of a therapeutic light with none of the expensive disadvantages.

Two weeks from the time of the last operation, the patient states that he could rest weight on his foot without pain.

The cast was removed, and it was found that the swelling had entirely disappeared from the joint. Pressure directly upward on the bottom of the foot did not give pain, but motions of flexion and extension did give pain, not in the joint, however, but in the periarticular structures, which were stiff and sore from the past inflammation, immobilization and disuse.

Massage was instituted. The massage is given to our cases by a specially trained nurse to whom the nature and extent of the injury has been carefully explained. The movements and manipulations that are desired are carefully discussed with her at the start of each case. She is directed to keep a progress report of each case. In this case the massage was preceded by one-half hour's baking under the electric light. It was started with an upward stroking of the tissues to drain as much as possible of the blood towards the heart. After this motion, deep massage of the tissues, rubbing the tissues beneath the skin by moving the skin with the fingers, not stroking the skin.

Passive motion is instituted after this treatment. The limb is firmly grasped above and just below the joint. The necessary movements are made slowly, gradually and up to the point just short of giving pain. Force, to any considerable extent, is not used, inasmuch as it breaks adhesions which were formed and contributes further to the stiffness of the joint. After sufficient time has elapsed to reëstablish some elasticity in the ligaments and reduce pain by motion, resistive motions are instituted to strengthen the muscles controling the member, and the patient is encouraged to use it actively. Overstretching in any joint which is

limited in motion by the rigidity of periarticular structures or fibrous adhesions between joint surfaces is not advisable inasmuch as it produces traumatism with consequent detrimental reaction.

Comments.—Comparatively slight injury aggravated by chronic infection which was treated purely as an injury with the result that the patient was disabled for more than a year. Whereas, a three months' disability would have been an excess in this case, if the true condition had been recognized immediately and treated correctly.

RUPTURE OF KIDNEY

R. M., male, aged forty-five.

History of Present Condition.—Patient fell from a loft, striking across a rail about twenty feet below, on the left side, at the level of the eleventh and twelfth ribs. He had acute pain in his left side, but was able to walk to a house about one hundred yards away, where he was placed on a stretcher and removed to his home. He felt very weak, had violent pain in his left side, radiating down into the left groin, with urinary irritation. He passed by urethra an unknown quantity of urine, which he says was heavy, thick, red material, which looked like blood. After a considerable quantity of this bloody material was passed, his pain was relieved for some hours, during which time he voided several specimens of the same kind. Gradually his pain began to be more severe again and the urine which he passed was clear for twelve hours. During this time he had to have morphine to quiet his pain. Rather suddenly the pain disappeared, and again he passed thick, bloody urine, with some clots. This process recurred three times in the first forty-eight hours.

Physical Examination.—We saw him about the middle of the third day after the accident. At this time he was having little or no pain; his pulse was 140, respirations ranging from 24 to 30. There was a bulging on the left side in the flank, and a very marked rigidity, especially on the left side of the abdomen. There was no dulness in the right flank on turning the patient on his right side. There was marked dulness in the left flank and down the left side of the abdomen, corresponding to the position of the descending colon, when the patient was lying on either his right or left side, and there seemed to be very little change in the location of this dulness, regardless of the position. There was an extreme point of tenderness over the left flank, posterior, at about the level of the twelfth rib. Patient was passing some urine tinged with blood, but not strongly colored with it. It was advised that the patient be transported to the hospital, which was done.

Laboratory Examination.—Blood count: red blood cells, 3,280,000; leukocytes, 20,100; differential count: lymphocytes, 16 per cent.; large mononuclears and transitionals, 3 per cent.; polynuclears, 81 per cent. Hæmoglobin 60 per cent. on date of admission to the hospital. Urine examination showed: albumen, a trace; few hyaline casts; red blood cells, five to ten to a field; white blood cells, five to ten to a field; few epithelial cells.

His temperature was 100⅕; pulse, 80, and respirations, 28.

X-ray pictures were not taken, inasmuch as it was not deemed necessary or advisable to move him to the X-ray room for diagnostic purposes. An operation was advised and performed as follows:

Operation.—Usual incision parallel to the twelfth rib, downward and forward towards the outer third of Poupart's ligament; immediately dark blood infiltrated tissue was encountered. The ilio-inguinal nerve was encountered and pulled to one side, where it would not be involved in future suturing of the tissues. Upon coming down to the capsule of the kidney, about three large double handfuls of broken-up blood clots were encountered and removed. Nothing could be seen at first of the kidney itself. The ureter was felt for, found and clamped and cut off. The upper pole of the kidney was then released by running the hand upward and backward along the anterior surface of the ribs, and much to the surprise of the operator the whole upper third of the kidney popped out upon the withdrawal of the operator's hand. It had been entirely severed, except by a slight adhesion of the anterior part of the capsule by a blow which had evidently been a combination of the twelfth rib being driven in and the sharp edge of whatever the patient struck on, just below it. The pulsation of the vessels in the pedicle could not be felt, the pedicle being very short. The kidney was not delivered until these were securely clamped with two eight-inch clamps. When the kidney was removed there was no hemorrhage whatsoever, and it was clearly demonstrated that the renal artery was entirely thrombosed, which, of course, was the saving factor in producing a stasis of the hemorrhage which saved the man's life, inasmuch as he was not operated on for three days following the injury. Had this thrombosis not occurred, undoubtedly the patient would have succumbed long before the operation. The vessels were ligated with silk in two places, as a protection against any future bleeding. The wound was packed with plain gauze around a large rubber drainage tube. The wound was closed in the usual manner, taking care not to include the ilio-inguinal or ilio-hypogastric nerve in the line of suture.

Patient received tap water per rectum for forty-eight hours, by the drip method, after the operation, and water was administered by mouth as tolerated. Carbohydrate food with a salt free diet was allowed as soon as the nausea was relieved, and large quantities of water administered for ten days following the operation.

Second day after operation urine showed: albumen, moderate amount; some granular casts, few white blood cells; a week after the operation: trace of albumen, no casts, no white blood cells.

Temperature the day after the operation was 100⅗; two days after the operation highest temperature was 99⅗; normal thereafter.

The packing was partly removed three days following the operation and entirely removed five days after. The wound was dressed daily. Iron and arsenic were administered for a blood tonic and the patient was up ten days after the operation and went home three weeks following operation. He was advised to abstain largely from meats for three months, being allowed fish, chicken and carbohydrate food. The wound entirely closed in about five weeks from the time of operation, there being no fistula remaining.

Comments.—The fact that this patient did not succumb immediately as a result of a complete rupture of this kidney is due, in all probability, to the fact that the vessels thrombosed, while there was a balance in pressure between the blood clots behind the peritoneum and the blood-pressure within the vessels. Had the thrombosis not occurred before the blood-pressure again came up to nearly normal, there would have been a recurrence of hemorrhage with probably a fatal result. A rupture of a kidney is, of course, an acute surgical condition and should be attended to immediately in order to save life with any considerable degree of success, since nature is not always kind enough to provide a thrombosis at the proper point and in proper time.

MALINGERING

J. L., male, aged forty.

History of Present Condition.—On February 21, 1919, this man fell fifteen feet from a ladder. He claims to have struck across a rail on his back.

Physical Examination.—Made on March 3, 1920, at which time he complained of tenderness on pressure immediately over the middle of the sacrum and at almost every place else from the seventh cervical vertebræ to the end of the coccyx. There is neither joint nor ligament nor attachment of muscle in the middle of the sacrum, and yet, when this man bends to the right or left, forward or back, he says it gives him pain here. He says he cannot stand with his feet close together, but, in spite of this, when he walks and turns around he puts his feet close together numbers of times, especially when his attention is called to something else.

Examination shows normal curves are present on both right and left lateral flexion, forward flexion and hyperextension. There is no atrophy or rigidity of any group of muscles, either in the lumbar or gluteal regions. The normal curves of the spine are present when standing erect. He has pain always in the spot where he is being examined; these spots are variable; when returned to they are not accurate. He complains of pain when pressure downward is made, but cannot localize this pain to any one spot; says it hurts him all over his back. Also complains of pain when he is lifted and the weight taken off his spine. Says this pain is located all over his back.

Insists that his sorest spot is in the middle of the sacrum. Patient was asked to stoop forward at an angle of about forty-five degrees; the flat hand was placed on about the seventh cervical and first dorsal and a sharp forcible blow was struck with the right fist on the flat hand at this point. He leaped forward and when asked where he had the pain, he said he had it at the point struck. It is evident to any one considering the anatomy of the back that a patient in the stooping position of forty-five degrees is placing a very large amount of strain at the junction of the fifth lumbar and sacrum and the sacrum with the ilii; that a heavy blow struck at the first dorsal region will drive the upper part of the spine forward and downward and throw acute strain at any point below this, inasmuch as there is a large amount of leverage. Any patient who has actual tenderness in the lumbar or sacro-iliac region will have an acute reaction of pain at that point and not at the point where the blow is struck. If there is inflammatory process in any part of the spine, it is axiomatic that that segment of the spine will be limited in motion by spasm of the muscles and that the pain will be located in that segment where the inflammation is present. This segment of limited motion will be present in both lateral flexion, forward flexion or hyperextension.

X-rays show a normal spine, except for possibly a little deformity in the formation of the fifth lumbar which is low-lying between the rings of the ilii.

Comments.—The diagnosis of malingering was made on the absence of definite localizing of findings, either physical or in the X-ray. Back conditions are often obscure, but it holds in the diagnosis of back conditions as it does in all other forms of injury or disease that certain symptoms are always present, constant and invariable, so far as location from an anatomical standpoint is concerned.

COMPOUND COMMINUTED FRACTURE OF BOTH BONES OF THE LEG NEAR THE ANKLE-JOINT

J. Q., male, aged forty-six.

History of Present Condition.—Patient received a compound, comminuted fracture of both bones of the leg, running from one and one-half to five inches above the ankle, which was treated by cast and conservatism, the fracture being dressed and fragments of bone being removed as they were discharged. It is now two years since the accident.

Physical Examination.—On November 24, 1919, examination shows a swollen, indurated leg, from about the middle to below the ankle-joint. There is ten degrees of motion of flexion and extension; lateral motion is entirely absent.

The joint is thick, indurated and tender. There is a deep ulcer down into the bone on the inside of the leg over the tibia, about the size of a fifty-cent piece. The skin around this is red, dusky and thick. There is a moderate amount of discharge from the wound. Patient is unable to rest weight on the foot with any degree of comfort. As before stated, this patient has been treated conservatively for two years; his health has been considerably impaired by the long drainage. No opportunity was afforded to make a urinalysis or blood count in this case, but the patient looks anæmic, says that he does not feel well and strong and looks as though he was telling the truth. He appears to be almost at the stage of amyloid disease and is certainly in a very poor state physically. This man was awarded total permanent loss of use of the leg.

Here is a man who has been out of work for two years, whose compensation has amounted to $15 a week for 104 weeks, whose loss in money has amounted to himself, $20 a week for at least 75 weeks—allowing for loss of time in non-employment. He now is in a worse condition than he was ten days after he was injured. He has a foot, or something that once was a foot, and ankle, which he cannot use for the purpose for which it was made, namely, locomotion. Not only this, but it is a constant source of menace to him, inasmuch as it is a focus of infection and seat of a constant drain on his health.

We are told to be conservative in our treatment of fractures, but what does conservatism mean. It certainly does not mean trying to save something that will never be of the slightest use to the individual in his daily life. Therefore, the offending member should have been removed, not two years after the injury, but inside of six weeks to two months, when it should have been apparent to the surgeon that the member would not functionate again, and therefore had best be done away with. If the patient would not consent to an amputation, recourse under the law is always open. If a man will not submit to proper treatment, his compensation may be suspended and the surgeon should have put it up to him flatly—either to have the leg removed or a petition should have been filed before the Industrial Commission on the basis that the man would not accept proper treatment. The Industrial Commission would have been advised by its Medical Director that compensation should be suspended, which would have been done, and the man would have been forced to accept proper treatment. A proper amputation being done, he would have been fitted with an artificial leg three months after the amputation and not more than six months would have elapsed from the time of the injury until he would have been paid for the specific loss of the leg, for which he

must now be paid anyhow. He would have saved himself untold discomfort, been able to resume his normal occupation or some other occupation for which he was fitted, even with the loss of his leg; he would have been in much better physical health; would have had more money in his pocket, to say nothing about his employer having a considerable amount more in his.

This case illustrates very plainly overconservatism and what it may lead to, both for the man and for the company, not only in loss of money, but in loss of health.

FRACTURE OF BOTH OS CALCI

W. O., male, aged thirty-eight.

History of Present Condition.—This man fell five and a half stories on January 30, 1919, almost a year previous to the date of the examination. He sustained a fracture of both os calci.

Physical Examination.—At this time the right foot shows a bad degree of pronation. There is very slight motion between the os calcis and astragalus; the scaphoid is pushed out and extremely prominent. There is some callus below and behind the external malleolus. Plantar fascia is tender at its posterior attachment and the ligaments supporting the scaphoid are tender. Flexion and extension of the ankle are normal. The left foot is pronated to a lesser degree than the right. There is considerable amount of callus behind and underneath the external malleolus. The lateral motion in this foot is about 50 per cent. of normal. The attachments of the plantar fascia are tender posteriorly, the scaphoid is pushed out and the ligaments around it tender. Considering this injury, the man has a remarkably good result, but not, however, due to the treatment, which consisted in putting the man's feet up in casts at about right angles to the long axis of the leg, and immobilizing them for some six weeks. There was no effort to invert the feet, the tendo-Achilles was not cut in either case, and it was only because the impaction of the fragments did not fracture into the astragalocalcaneal joint that there is any lateral motion present at this time.

The man's main disability at this time is due to the pronation of the foot, which is causing a progressively increasing degree of painful flat-foot. There is pain behind and underneath both external malleolii, due to the fact that the peroneal tendons are being pinched between the external malleolus and the callus. The posterior fragments of the os calci were forced forward and rotated outward at the time of the injury, thus changing the axis of the foot towards the outside and having a tendency to throw the weight on the arch and further pronate the already pronated foot.

This case should be treated now by building up the inner margin of the heel three-sixteenths of an inch, supplemented by a strong but

elastic arch support. This should not be a steel support, but rather an elastic support which would hold the arch up but not relieve the plantar fascia and ligaments of their duty of supporting the longitudinal arch. If a shoe with a strong arch can be supplied, felt cut in the shape of a wedge under the longitudinal arch and sewed or pasted to a thin leather insole, will give the most comfortable support, and at the same time massage the plantar fascia and ligaments at each step, which improves the circulation and gradually strengthens them, so that they can function normally.

The disability judged in this case was a 50 per cent. loss of use of the right foot and a 35 per cent. loss of the left foot at the present time, which can be reduced by proper treatment, as suggested, to a 25 per cent. disability in the right foot and a 15 per cent. disability in the left foot.

Comments.—Had this patient had the proper treatment he should have been back to work in from two to three months with no more than a 15 per cent. disability in one foot and a 10 per cent. disability in the other.

Estimate of extra time loss on account of improper treatment, nine months.

Estimate of increase in disability on account of improper treatment, 35 per cent. in one foot, and 25 per cent. in the other.

" Fractures of the os calcis are due to two factors: direct violence by a fall on the sole of the foot, and a strong contraction of the gastrocnemius, making a sudden pull upward, thereby putting tension on the Achilles tendon. We have to deal here with a short fragment attached to one of the strongest muscles of the body, tending to displace it gradually even farther than it was carried by force of the direct violence, and in the same direction (from C to D; Fig. 1). This short posterior fragment forms the posterior third or quarter of the longitudinal arch of the foot (E to H), and, when displaced upward, lowers the arch of the foot (changing CG to DG), at the same time stretching or tearing the bowstring which holds this arch normally (GH) and is attached to the anterior surface of the posterior fragment of the os calcis, running forward to its fan-shaped anterior attachment around the metatarsal articulations. The result of the tearing or laceration of the plantar fascia, which was referred to as the bowstring of the arch of the foot, results in a flattening of the anterior portion of the arch of the foot, which, in turn, and in conjunction with the

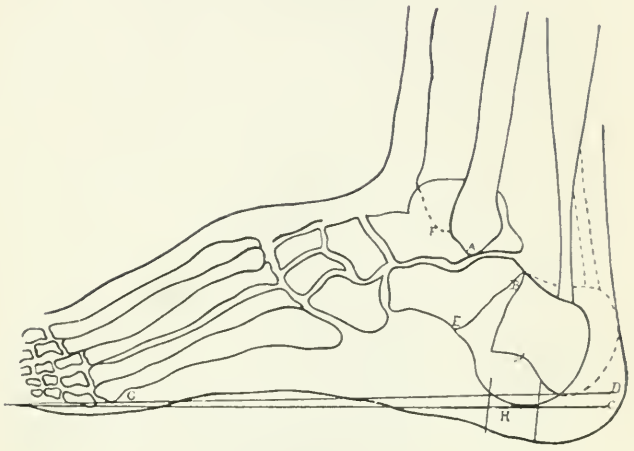
lowering of the posterior portion of the arch due to fracture, allows the foot to evert (bringing E and A nearer each other), thereby bringing the fractured surface of the os calcis upward and outward toward the external malleolus (A to B). This results, if allowed to progress to the deposition of callus around the fracture, in mass of callus formation just behind and below the external malleolus (between A and B), pinching the soft tissues between two bony surfaces, and giving severe pain. The foot, thus being everted, causes the weight line which normally should fall on the middle metatarsal bone to fall on the first metatarsal bone or inside of it, further throwing a strain on the already lacerated ligaments of the longitudinal arch and causing further flattening of the foot.

Fortunately nature has provided an easy way to rid us of the upward pull of the gastrocnemius by making the Achilles tendon in such a way that it heals readily after subcutaneous tenotomy without further surgical procedure, and is firmly united by the time the fractured bone has become solid.

It is a simple procedure to introduce a tenotome under the skin and completely sever the Achilles tendon, thereby ridding us of the only tendency to displacement of the posterior fragment, which can now be replaced with the assurance that there will be no displacement on account of muscular action. If the fracture is impacted, the foot should be placed over an orthopædic block (Fig. 2) with one hand above the heel and the other over the metatarsal bones, and the impaction broken up, forcing the heel and toe down and toward each other. This increases the arch and at the same times moves the fractured anterior surface of the posterior fragment downward and inward, increasing the distance between it and the external malleolus. The fragment replaced, the foot can then be put in a plaster cast in strong inversion (Fig. 3), further removing the line of fracture from the external malleolus. Before the cast is dry, the base of the thumb should be placed in the arch of the foot, holding the soft plaster up against it. In this way there is an overcorrection, bringing the ends of the lacerated plantar fascia into apposition, and allowing the traumatized ligaments of the sole of the foot to contract before the cast is removed.

The cast should be allowed to remain on the foot for at least four weeks and the patient admonished not to rest any weight whatsoever

Fig. 1.

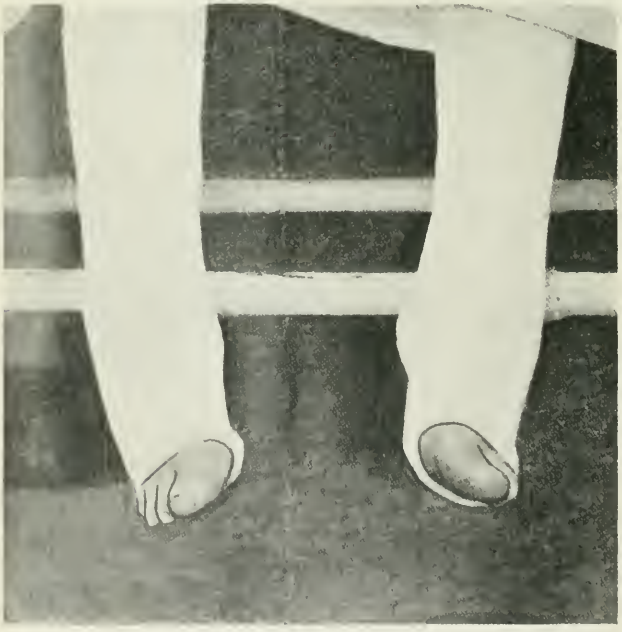


Mechanism of fracture of os calcis.

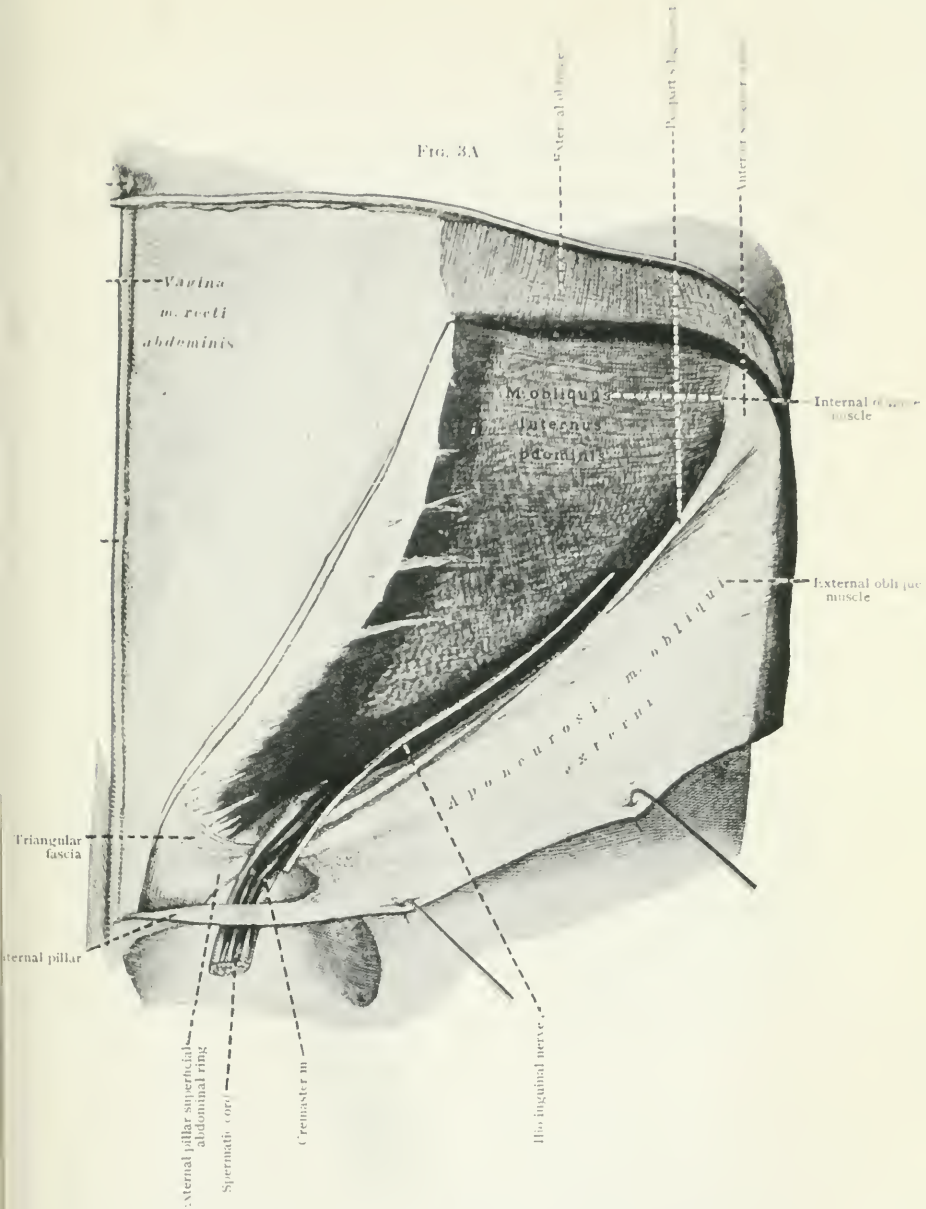
Fig. 2

The proper position of the hands on the foot in bringing the heel and the toe close together over an orthopædic block and the reduction of fracture of the os calcis. If impaction is too firm to be broken up in this way, the foot should be placed in a sand bag and the posterior fragment struck a sharp blow with another sand bag which will relieve the impaction.

Fig. 3.

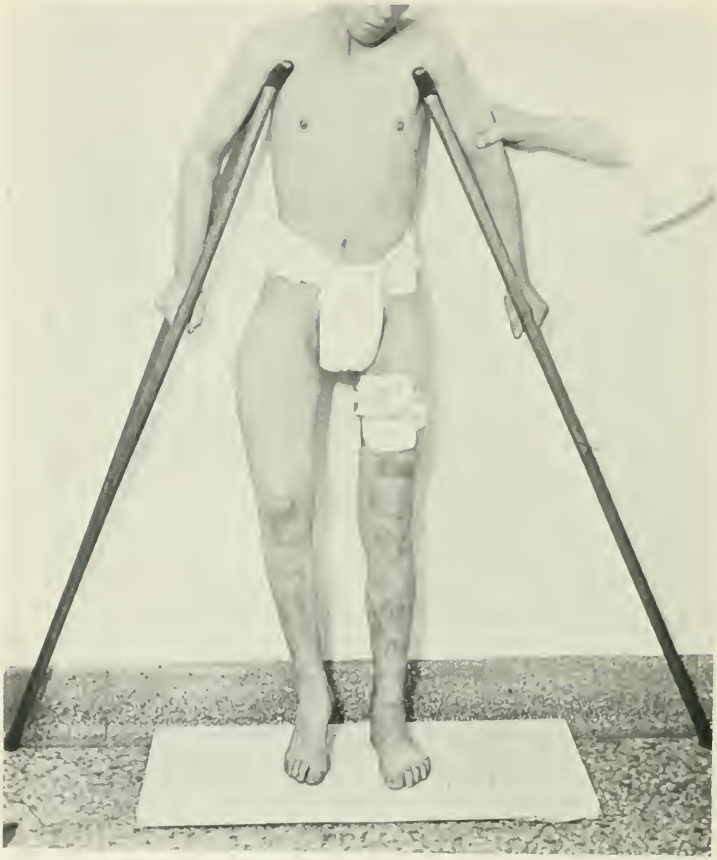


The position of the feet in plaster. Strong inversion with pressure under the instep.



Showing course of ilio-inguinal nerve. From "An Atlas of Human Anatomy," Carl Toldt.

Fig. 4.



Fracture of femur—non-union. Shows the 3-¾ inch shortening of right femur and the angulation.

on it until two months have elapsed. When the cast is removed, dry or moist heat applications with expert massage should be instituted to increase the circulation in the ligaments and fascias of the sole of the foot, establish motion in the ankle-joint, and loosen the adhesions about the Achilles tendon. At the end of the two months the patient should be encouraged to put weight on the foot gradually, care being taken to notice whether the callus around the fracture is solid enough so that it will not allow angulation of the posterior fragment. The ligaments in the sole of the foot being weak and having a tendency to allow the foot to evert, the sole and heel of the shoe should be built up from one-eighth to one-quarter inch on the inside of the foot, so that the body weight will fall on the flat outside portion of the foot and not overtax the weakened ligaments of the arch. The arch may be supported by adhesive plaster strapping in conjunction with a felt pad either held on by the straps or sewed on an insole, and placed in the shoe in such manner as to support the longitudinal arch. (Magnuson, *Jour. A. M. A.*, Feb. 17, 1917.)

ILIO-INGUINAL NERVE IN HERNIA SCAR

H. C., male, aged twenty-two.

History of Present Condition.—This man sustained a right inguinal hernia in March, 1919; was operated on April 28, 1919, and since the operation has complained of pain continually, especially on exertion. This is referred to a point at the junction of the inner and middle third of the scar, which is well healed and not abnormally thick. Examination was made on July 2, 1919, and the man had not done any work since the date of the operation on account of this pain.

Physical Examination.—Examination showed tenderness at the inner and middle third of the scar in a constant, fixed point. This pain increased on motions, especially rotation to the right and hyperextension or flexion where the thighs pressed upon the abdomen, or upon lifting, which put the abdominal muscles on the stretch. This point was also tender to pressure, and no matter how much the attention of the individual was distracted from the examination, the minute the point was touched, a sign of pain was elicited.

Diagnosis.—Ilio-inguinal nerve caught in hernia scar, probably by suture. Recommended that the nerve be released by operation.

Operation.—He was sent to the hospital for operation on July 28, was operated on the 29th by an incision made an inch towards the median line and about one-half inch above the antero-superior spine. Nerve was exposed, running downward and forward in its usual course under the fascia (see illustration 3 A). It was evulsed by a blunt-nosed artery forceps; the wound was closed with three silk-

worm-gut sutures and patient returned to bed. The next day patient requested his clothes and was allowed to get up. He went home to the southern part of the state, a journey of some three hundred miles, on the fourth day, and claims to have had not the slightest pain from the date of this operation. He returned to work fifteen days following the operation. There was no danger in allowing the patient to resume the standing position, inasmuch as nothing had been cut but the skin, a few fibres of the fascia having been separated to expose the nerve.

FRACTURE OF THE FEMUR—MALUNION

J. M., male, aged nineteen.

History of Present Condition.—Sustained a fracture of the right femur six months previous and comes with bowing of the right leg at the junction of the upper and middle third of the femur. (See Fig. 4.)

Physical Examination.—Shows a three and a half inch shortening in the measurement between the anterosuperior spine and the internal malleolus on the right side. There is a solid, bony union. Patient complains that he has pain upon resting weight on the injured member, pain being in the hip.

X-ray shows a flexion and abduction of the upper fragment with a fracture at the junction of the upper and middle third of the femur, an adduction of the lower fragment and an overlapping, a coxavara produced by the abduction and external rotation of the upper fragment, all of which contribute to the shortening. (See Fig. 5.)

This patient being young, healthy and vigorous, an operation was advised for the removal of the callus and reapposition of the ends of the fragments.

Operation.—This was done on June 28th. Incision was made about two and a half inches anterior to the posterior margin of the vastus externus, exposing the fascia lata, which was split about one and one-half inches posterior to the skin incision. The posterior fascia was loosened from the vastus externus and the loose margin of the externus reflected forward and retracted. In this way there were no vessels of consequence cut and no hemorrhage, the bone being exposed without interfering in any way with muscular attachments. A large amount of callus was found between the sides of the fragments; this was cut away with a sharp, thin-bladed chisel and the fragments freed well above and below the fracture from their muscular attachments. The patient previous to the operation had been secured to the table in a manner described by Doctor Magnuson in an article in *International Journal of Surgery,* March, 1917, as follows:

"Where we are called upon to operate on an ordinary operating table and yet use great force in reducing fractures, overcoming the

Fig. 5

X-ray showing abduction of upper fragment and adduction of lower fragment, with overlapping.

Fig. 6.

Fig. 7.

Showing results of operation—no shortening and no angulation.

Fig. 8.

Result of operation with ivory plate in place—no shortening

Fig. 9

Showing fracture of the 1st, 3rd, 4th and 5th metatarsals at the middle of the shaft and the 2nd metatarsal at the proximal end. At the 3rd, 4th and 5th metatarsal bones there is seen considerable callus which pressed on the external plantar nerve branches, causing severe pain.

pull of the muscles, it is necessary to use such mechanical means as can be had at the time.

"The most successful and simple method which has been tried by us is that of placing the patient with his shoulders at the level of the upper edge of the operating table, allowing the head to extend over and be supported by a smaller table placed at the head of the operating table. A sheet is then passed between the thighs, one end over and one end under the patient's body, the ends meeting over the shoulder on the affected side. These ends are tied to the upper part of the operating table and form a very efficient means for holding the patient firmly against the pull of the extension to be applied in the opposite direction. A loop of ordinary muslin bandage or bed ticking is passed around the patient's ankle in a clove hitch or by the traction bandage described by Dr. Howard Collins (*Annals of Surgery,* vol. lxiv., July, 1916, p. 65). Into this loop of bandage is caught a hook attached to a compound pulley, the traction for the pulley being obtained from the foot of the table. Extreme traction may be applied in this way without effort on the part of the assistant, since the compound pulley gives enough leverage to overcome the pull of any group or groups of muscles; the traction may be continued over any period of time necessary for the operator's convenience."

A gradual stretching of the muscles, nerves and blood-vessels does not produce any considerable amount of trauma, if done slowly enough, but if done rapidly gives a very considerable amount of shock and care must be taken not to produce this. Tension on the muscles has a tendency to minimize hemorrhage. When the ends of the fragments had approached near enough to be angulated out of the wound and brought into apposition, this was done by the use of a Lane forceps on each fragment. The ends were then angled back into the wound and the extension removed, a Magnuson lateral bone clamp was then placed to hold the fragments in apposition while an ivory plate was inserted. Doctor Magnuson, in *Surgery, Gynæcology and Obstetrics,* November, 1916, sums up the advantage of this method as follows:

"In transverse fractures it is impossible to use screws alone. It was therefore necessary to devise some method which would meet the following requirements:

"1. Minimum traumatism in application.

"2. The substance must be non-irritating to the bone and soft tissue.

"3. It must remain *in situ* without loosening.

"4. It must be strong enough to hold against strains in any direction, and the constant pull of any group of muscles without allowing angulation or shortening.

"In order to meet the first requirement, the apparatus must necessarily be small. It had been proved that ivory was non-irritating to bone and soft tissues. It had also been proved that ivory did not loosen, which was also true of dead bone. The fourth requirement—strength—gave ivory the preference over dead bone, and it was, therefore, used instead of the latter.

"The method used consisted in the cutting of a slot or, as mechanics term it, a keyway into the bone by parallel circular saws, the slot being exactly the width and length of the plate to be used and extending across the fracture in the long axis of the bone, the length of the largest plate being one and three-fourths inches long and three-sixteenths inch thick by one inch wide. A keyway and key is the strongest form of mechanical union known so far as a shaft is concerned, the key being braced on all sides but one by the material into which it is driven. As long as this key remains in the keyway and is fixed by pegs driven through the key and shaft at an angle to the key holding it down into the slot, it is impossible for any motion to take place between the fragments of the shaft. This operation eliminated the necessity of loosening the muscles from the shaft for more than an inch on each side of the fracture, reducing the amount of traumatism to a minimum. The retention apparatus is very small and is, as previously stated, non-irritating. The plate is driven snugly into the slot cut through the proximal side of the cortex only, its lower edge being driven tightly against the medullary side of the opposite cortex. As in the case of the screws, the application is snug, but not tight enough to produce necrosis of the bone-cells immediately in contact with it. The ivory, being braced on all sides by the bone cortex, has sufficient strength to resist all strain which is exerted on the fragments by the muscles, and in the very nature of its application will not allow the slightest angulation. This operation has proved very satisfactory not only in the hands of the author, but, at this writing, in the hands of many surgeons. Special

instruments are needed to perform it, but this is true of every operation as it is in other mechanical lines of work."

The bones being firmly fixed, the clamp was removed, the vastus externus tucked beneath the fascia, fascia sutured with plain catgut and the skin closed in the usual manner. A plaster spica run from the hips to below the knee was applied.

The Murphy drip was instituted, when the patient was returned to bed, to counteract the shock that is bound to occur in all operations on the large bones. Two weeks following the operation the back of the leg cast was removed as high as the knee and passive motion instituted to prevent fixation of the knee. The patient was allowed to be up on crutches with a high sole on the opposite shoe in three weeks. There was no extension applied, inasmuch as this fixation method retains the fragments against the pull of the adductor muscles, which is the strong displacing effect of all fractures of the femur, especially at the junction of the upper and middle third. There is no bone atrophy from pressure and consequently no chance for angulation. The cast was removed entirely in eight weeks, and in ten weeks patient was allowed to use the leg in walking. As is shown by the illustrations there was no shortening, and the patient returned to his previous occupation without disability. (See Figs. 6, 7, and 8.)

Comments.—This case had been treated previously by Buck's extension only, not even having the precaution taken to raise the foot of the bed about eight inches to act as counter-extension. In consequence of this, the patient's foot rested against the foot of the bed, where the weight had pulled it most of the time. The great muscles of the thigh were allowed to contract, the adductors pulling the lower fragment upward and inward and the psoas and rotators throwing the upper fragment into flexion, external rotation and abduction. When Buck's extention is applied as treatment for the femur, there must always be counter-extension applied with it in some form.

FRACTURE OF THE METATARSALS—PRESSURE ON PLANTAR NERVES

J. H. V., male, aged twenty.

History of Present Condition.—This man received a fracture of the first, third, fourth and fifth metatarsals at about the middle, and the second metatarsal at the proximal end, in the left foot. His present complaint is that he is unable to rest any weight on this foot without severe pain.

Physical Examination.—Examination shows a normal appearing foot with no gross deformity except a little outward bowing at the fifth metatarsal. His point of greatest tenderness is on the plantar surface of the foot about the middle of the fourth metatarsal, and at this point a hard, smooth object can be felt beneath the deep structures. Pressure at this point gives him severe pain. Grasping the foot between the thumb and fingers, making lateral pressure, gives him extreme pain.

X-ray shows that the second metatarsal is displaced downward and at this point there is also severe pain on pressure, but not as severe as under the fourth. The third, fourth and fifth metatarsals are displaced slightly downward and bowed outward. There is a considerable amount of callus between the bones of the third, fourth and fifth, almost obliterating the space between the shafts of these bones. (See Fig. 9.)

Anatomy.—The plantar nerves are branches of the posterior tibial, run behind the internal malleolus and divide about the level of the scaphoid, breaking up into the external and internal plantar nerves which run down between the shafts of the metatarsal bones on the plantar surface. If, for any reason, there is formation of nodules, fibrous or bony tissue, which impinge upon these nerves when weight is rested on the foot, a severe metatarsalgia is the result. Even if these nerves are not impinged upon, the downward bowing or an exostosis on one of the metatarsals which produces excessive pressure at one point will give severe pain after walking for any considerable distance. Ultimately this develops a callus on the bottom of the foot from excess pressure at this point, which further increases the pressure and adds to the pain.

Comments.—This patient was awarded a total permanent disability of the foot until such time as the callus was properly removed from these metatarsals to relieve the pressure symptoms. Patient was injured on August 29, 1919, and was examined on February 18, 1920; a period of six months had elapsed, during which time he had drawn compensation at the rate of $12 a week and had lost his earnings in excess of $12 a week to the amount of $30 a week.

An injury of this kind, if properly handled by excision of the callus after it had formed, should not have disabled the man for more than three months. The operation will now have to be performed, and it will be nine months from the time of the injury before the patient is returned to work. This makes a very considerable loss to both the patient and his employer, because the fact was not appreciated that this young man had a very real pain and was not malingering, of which he was accused.

Operation.—The operation for the removal of the callus should be done from the dorsum of the foot, since the placing of any scars on the sole of the foot, especially on the weight-bearing parts of the sole of the foot, constitutes a partial permanent disability. Scars are ridges and ridges are painful when they occur on weight-bearing

organs at the place where the weight is transmitted. The callus should be removed, not with a curette, but with a sharp, thin-bladed chisel, which will remove it and not scrape up the periosteum so that new callus will form in its place from the surgical injury. The inferior surface of the bone can be reached through the side of the foot if it is impracticable to reach it purely from the top. It would be preferable to resect a part of the shafts of the bones and place small bone grafts between the ends rather than allow a bulging callus on the plantar surface of the foot. The result of this operation, if properly done, should be a complete restoration of the foot to normal.

MALUNITED FRACTURE OF BOTH BONES OF THE LEG AT THE ANKLE

P. F., male, aged forty-five.

History of Present Condition.—This patient sustained a fracture of both bones of the left leg, the tibia being fractured about an inch above the ankle and the fibula at the level of the lower articular surface of the tibia.

Physical Examination.—Shows slight posterior displacement of the lower fragment on the upper fragment of the tibia, a marked eversion of the foot with the weight-bearing line falling an inch towards the medial line of the body from the great toe. The left leg measures from the junction of the tibia and the femur to the internal malleolus fourteen inches; the right leg measures fourteen and three-fourths inches. There is some induration around the ankle, patient complains of pain underneath the external malleolus, in the plantar fascia at its attachment and in the middle over the attachments of the scaphoid bone. The scaphoid is prominent, there is marked swelling of the leg; flexion and extension of the ankle-joint are almost normal, slight limitation of plantar flexion. There is limitation of lateral motion to about 25 per cent. of normal.

X-ray discloses that the astragalus is angulated outward at its lower surface, giving an angle of about fifteen degrees to the direct weight-bearing line of the leg. The articular surface of the astragalus impinges upon the lower end of the upper fragment of the fibula. (See Fig. 10.)

In spite of this fact, there was very little crepitus in the joint on passive motion, but the patient complained of pain at each step, in the ankle-joint, and walked with a very marked limp. He said he was unable to be on his feet for any considerable length of time, and after walking two blocks or so developed extreme pain in the ankle-joint and foot.

This patient was awarded 65 per cent. loss of use of the leg, after nine months of disability, on account of this injury.

Comments.—The weight-bearing line of the leg on the foot should normally fall from the anterosuperior spine, through the middle of the patella and to the middle toe. If the line falls towards the great toe, the patient has a marked tendency to overstrain the plantar fascia of the foot, which is the bowstring of the arch and which is not meant

to carry weight to any severe degree, but is meant to supply the spring in walking. Eversion of the foot gradually forces the scaphoid, which is the keystone of the longitudinal arch, out of place, straining the ligaments which support it and allowing a further strain to fall on the plantar fascia.

Treatment.—Aside from the correction of clubfoot or pes cavus, we know of no condition in the foot or ankle which should not be put up in strong *inversion with the foot at right angles to the leg.* In this case, more inversion of the foot would have pulled on the external lateral ligament of the ankle-joint; forced the astragalus over against the internal malleolus; pulled the fibula back into line, or very nearly into line; brought the articular surfaces of the lower end of the tibia and astragalus into proper apposition; re-established the normal mortis of the ankle-joint and made this a comparatively slight disability.

The reason for this man's pain under the external malleolus is the same as in a fracture of the os calcis, namely, the pressure of the soft tissues between the os calcis and the external malleolus caused in both instances by eversion of the os calcis with the addition of callus at this point.

If a cast had been properly applied in a case of this kind, and removed in three weeks, massage of the soft tissues of the leg, ankle and foot, supplemented by the application of dry heat, had been immediately instituted, followed when the patient began to bear weight by the building up of the inside of the heel by a wedge of leather and the support of the arch until the tissues had again regained their normal strength, the result would have been practically a normal foot.

Disability.—This injury should have resulted in a disability of not more than 10 per cent. of the foot, and patient should have been disabled not more than four to six months at the most. Whereas, the patient has been totally disabled for nine months and will have a loss of 65 per cent. use of the foot and be in constant pain for the rest of his life when walking.

OVERSTRETCHING THE CERVICAL PLEXUS

H. M., male, aged nineteen.

History of Present Condition.—On May 12, 1919, patient's right hand, on which he was wearing a glove, was caught in a wire-winding machine, which was revolving from right to left. His arm was carried around the outside of the shaft, the shaft striking his head and neck and forcing it away from his arm; at the same time twisting his arm. He suffered a dislocation of the shoulder

with a paralysis of the muscles supplied by the musculospiral nerve, also a paralysis of the supraspinatus, infraspinatus and deltoid muscles, and probably the subscapular. These muscles, it is claimed, were paralyzed immediately; he noticed particularly his inability to extend the wrist. The dislocation was reduced and the arm immobilized against the chest wall with the hand and wrist put up in extension by a splint.

Physical Examination.—At the time of the examination, which was on October 17, the function of the extensors of the wrist had returned so that the patient had normal control, although some loss of strength. There was extreme atrophy of the deltoid, the supraspinatus and infraspinatus. There was absolute immobility of the humerus on the scapula. There was abduction of the arm passively about thirty-five degrees, due entirely to motion of the scapula on the ribs. As a result of this injury at the time of the examination there was an estimate of 75 per cent. disability of the arm, because the patient had practically no control over the motions of the shoulder and as a matter of fact had no motion in the shoulder itself. This patient was advised to undergo treatment for the correction of these conditions as follows:

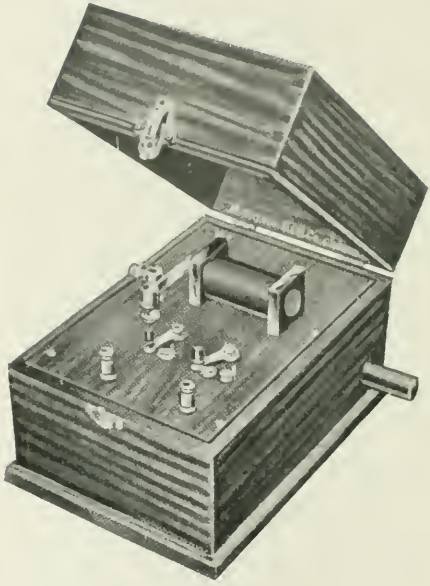
1. Abduction of the arm by an aeroplane splint.
2. Electrical stimulation by Bristow coil, which is a modification of the faradic current.
3. Manual massage of the muscles, passive motion and physical resistive exercises after the muscles have returned to sufficient strength to warrant this.

The first of these is done for the purpose of relaxing the paralyzed muscles. The importance of this is shown in this case, since the muscles supplied by the musculospiral nerve were relaxed and their opposers stretched by a cock-up splint and these muscles returned to function promptly. While the muscles supplied by the nerves from the same cord of the brachial plexus and from some of the same cervical routes did not return to function and went on to progressive and severe atrophy because they were not relaxed.

The second, electrical, stimulation: In the early stages of nerve injury the muscle will only respond to the galvanic current (constant), and there will be no response to faradic current. The muscles should be tested for a return of faradic excitability from time to time. When this occurs, about ten minutes daily of graduated contraction by the Bristow coil should be given once daily.

W. R. Bristow, in "Treatment of Joint and Muscle Injuries," says of his method of graduated contraction with his coil, that the muscles are stimulated to contract by an induced (faradic) current and the contractions are exactly graduated by the operation. The restoration of muscle tone is brought about by the muscular contractions themselves and not by the electricity. The contractions from this system simulate very closely normal physiological contractions.

Fig. 10.A



The Bristow Coil.

Fig. 11

Ivory screw through shaft and head of humerus holding fragment in firm apposition. This material is absorbed in from six months to two years, is stronger than beef bone and is non-irritating to bone and soft tissues.

Fig. 12.

Note narrow low-lying fifth lumbar vertebra with ragged callous formation to right of body and between 4th and 5th vertebræ, also long lateral 5th lumbar process on same side.

Third: Massage stimulates nutrition of the muscles and reduces the amount of fibrous tissue and restores elasticity. Passive motion to maintain the smoothness of the joint surfaces and prevent the formation of fibrous adhesions between these surfaces and prevent contractures of the capsule of the joints involved. Resistive motion strengthens muscle fibres after they are once reëstablished, but should not be instituted until the muscle has regained sufficient strength to exert a considerable affect on its bony attachment.

In this case there was the additional complication of a bony projection from the anterior surface of the glenoid process to the anterior surface of the head of the humerus, just below the greater tuberosity, which bony ridge effectively prevented any motion between the humerus and scapula. It was necessary in this instance to remove this bone before any considerable degree of abduction could be obtained.

Operation.—This operation was performed by an incision running through the anterior portion of the deltoid muscle on a line about corresponding with the coracobrachialis. The deltoid muscle was split almost from its insertion to its attachment to give a wide operative field. The circumflex nerve being posterior to this and the brachial plexus being internal and inferior to it, there was no danger of interfering with the function of either of these.

The attachment of the bony ridge to the humerus was exposed and with a sharp, thin-bladed chisel was removed from its attachment to the humerus. It was then followed forward and inward to its attachment to the anterior inferior surface of the glenoid, where it was chipped off, again with a sharp chisel. In removing these bony bridges, it is important to remove also the covering of periosteum which formed them, and especially near the joint surface, as this one was, it is important not to leave any sharp or rough, ragged edges.

The wound was closed in the ordinary way by two or three interrupted catgut sutures through the muscle, loosely tied, continuous catgut suture through the fascia and silkworm gut interrupted sutures in the skin. While the patient was still under the anæsthetic, the arm was fully abducted, pressure being put on the corocoid and on the outer surface of the scapula, to hold this bone in place, with the inferior capsule of the shoulder, teres major, latissimus dorsi and pectoralis major were thoroughly stretched by slow and gradual, but strong, abduction. The arm was placed then in a full abduction splint and the patient returned to bed. The arm was left in the full abduction splint without being moved for ten days, at which time the stitches were removed and the arm removed from the splint for the first time.

Passive motion instituted. Anterior and posterior motion to full right angle, abduction and adduction motions were slowly performed. This was done daily, supplemented by electric dry heat to promote circulation and aid in removing soreness and stiffness to the muscles and joint capsule. Electric stimulation was reinstituted, and in less than six weeks from the date of the operation resistive exercises were instituted, since the muscles had regained enough strength to

warrant this procedure. Patient was encouraged to use the arm, and some of the other patients in the ward were requested to give him exercises in the way of pulling and pushing and general gymnastics. There developed quite a competition in this way, which was conducive to a rapid recovery. Within three months from the time of the operation the patient returned to work, not normal, but sufficiently recovered to return to his former occupation, and with the disability in this arm reduced to 10 per cent. instead of 75 per cent.

Moral.—Relax all paralyzed muscles and stretch their opposers at once.

SPONTANEOUS FRACTURE OF FEMUR

Mrs. C. L., aged thirty-two.

History of Present Condition.—Six weeks prior to examination, which was made December 28, 1919, this patient claims to have been walking across the floor of her place of employment when she slipped, fell and broke her left femur.

Physical examination shows fracture of the left femur at the junction of the lower and middle third, large swelling of the thigh, somewhat spindle-shaped in the lower half. Palpation shows an enlargement in the diameter of the bone with an irregular transverse fracture through the upper third of the spindle-shaped enlargement of the femur. A careful history of the case disclosed that this patient did not stumble or fall over anything and did not have any pain, at least not severe pain at the time she fell. She cannot tell exactly whether she fell and broke her leg or broke her leg and fell. There is no shortening, glands in the femoral and inguinal region are present and about the size of a large pea. They are not tender.

Laboratory findings are as follows: Blood, 4,800,000; leukocytes, 12,600; differential count lymphocytes, 20 per cent.; large mononuclears, 4 per cent.; polymorphonuclears, 76 per cent.; hæmoglobin, 90 per cent.; Wassermann, negative. *Urine*, small amount of albumen, no casts or white blood cells.

Operation.—Was advised for the removal of one or more of the inguinal glands for microscopic section which was done on January 10th, which disclosed a spindle-cell sarcoma. Amputation of the leg was not advised, inasmuch as the disease had gone above the point of any possible amputation, and X-ray or radium treatments were recommended.

Treatment.—Four X-ray treatments were administered during the first two weeks after the operation, using a Coolidge tube.

Within three weeks of the operation the diameter of the leg had diminished 25 per cent. and the treatments were shifted to the glands in the inguinal and femoral region. After three weeks' treatment these glands diminished in size about 50 per cent. Union has occurred in the fracture, and while it is not believed that a cure will be affected, the condition has been materially relieved and the patient's life made happier and in all probability prolonged. There has been no pain up to this date.

Comments.—This condition was treated in her home as a fracture of the femur as a result of the fall for some six weeks before the patient was sent to the hospital. If the matter had progressed for a much longer time there would have been a serious question before an

industrial commission as to whether the fracture had caused a stimulation of growth or was the cause of growth of a sarcoma, or whether the fracture was the result of the sarcoma, and the employer forced to pay for not only the injury, but probably the loss of life.

FRACTURE OF THE SURGICAL NECK OF HUMERUS

M. H. C., male, aged thirty.

History of Present Condition.—Patient fell on January 18th, striking his left shoulder on a cement floor. He was unable to use the arm from that time, on account of severe pain. Shoulder swelled rapidly. He was brought to the hospital immediately and X-ray taken without manipulation.

Examination.—X-ray showed a fracture of the surgical neck of the humerus, with the head displaced downward and the lower end of this fragment abducted by the muscles attached to the greater tuberosity.

Operation.—Inasmuch as it was impossible to reduce the fracture and there was considerable hemorrhage beneath the deltoid, the bone was exposed, on the second day, through an anterior deltoid incision, clots evacuated, fracture reduced by traction and abduction of the lower fragment. There was some comminution of the cancellus bone, and it was impossible to get exact approximation, as it often is in this type of injury. The X-ray often does not disclose the many lines of fracture that occur in cancellus bone, if the rays do not happen to pass through the line of fracture or in the same plane with it.

An ivory screw was inserted from below, driven upward, inward and backward, to engage the large part of the head and obtain the greatest leverage. (See Fig. 11.)

Ivory screws with machine threads are used instead of metal, because they do not cause pressure necrosis of the surrounding bone and are eventually absorbed, they being bone material. They are much stronger than beef bone screws and are tolerated by the living bone as well as the latter.

Method of Application.—A hole is made in the bone with a twist drill, nine sizes (screw gauge) smaller than the screw to be used. Ordinary mechanics' tap is then put through this hole to prepare threads exactly the size and shape of those in the screw. The screw, which is made of straight grain elephant ivory, and with head cut square for use with socket wrench, is then inserted and cut off flush with the cortex leaving nothing protruding to injure or irritate the soft parts.

The arm was fixed with adhesive plaster with a pad between the

humerus and the ribs to prevent movement while patient was recovering from the anæsthetic. The next day the adhesive plaster was removed which held the arm to the body, and very slow, gentle, passive motion instituted. Stitches were removed at the end of the seventh day, at which time the arm could be brought up to right angles without serious pain. Patient left the hospital in ten days, at which time he was able to lift the arm to a right angle without pain. This was entirely due to the fact that the fragments were firmly fixed, allowing no motion between them, and is true of any fracture which is so fixed. The advantages of this method are as follows:

1. The ease and rapidity of application of this appliance.

2. The non-irritating qualities of the appliance, eliminating the necessity of subsequent removal.

3. Firm fixation, which does away with the necessity of long immobilization, which in the shoulder-joint is much more serious than a fracture itself which has been properly replaced.

Anatomical Considerations.—The shoulder, more than any other joint in the body, becomes rigid under immobilization, with a greater degree of regularity, because the abductor muscles or those which raise the arm away from the body have an extremely poor leverage with the exception of the deltoid. The supraspinatus, infraspinatus and teres minor are attached to the greater tuberosity and with the deltoid act as abductors of the arm. The deltoid, while it has a greater leverage than any of the rest, also has a troublesome bursa which lies between it and the head of the humerus, the surfaces of which quickly become adherent upon immobilization, which seriously limits the power in this muscle on account of the pain that is produced by the pulling on these adhesions. On the other hand, the adductor muscles of the arm, namely the subscapular, teres major, latissimus dorsi and the pectoralis major, are more powerful and have a greater leverage than the abductors. In addition to this, they have the force of gravity constantly assisting them in holding the arm down to the side. With these things in mind, it can be easily seen that once an arm is held at the side a sufficient length of time to allow the subscapularis, teres major, latissimus dorsi and the pectoralis major to become contracted, the surface of the subdeltoid bursa to become adherent and the supraspinatus, infraspinatus and teres minor to become stretched and weakened from disuse, that these stretched and weakened muscles not only

have to overcome the force of gravity, but they must overcome the pull of the stronger muscles which are contracted. In addition to this, fibrinous adhesions form in the shoulder-joint with a fair degree of rapidity, which adds to the complexity. It is necessary, therefore, in shoulder injuries to do one of two things: Fix the fragments firmly so that at least passive motion can be instituted within two or three days of the time of injury, or bring the arm to a right angle in fixation, so that the strong adductor muscles are stretched and the weaker abductor muscles are allowed to contract. This right-angle fixation should always be in external rotation; that is, with the hand pointing upward, above the head. In internal rotation with the arm at right angles the greater tuberosity impinges against the acromion process, which gives pain and sometimes troublesome adhesions. With the arm in external rotation the greater tuberosity is thrown back of the acromion and in addition the internal rotators, namely, the subscapularis, teres major and latissimus dorsi, are stretched. This allows the weak external rotators or the teres minor and infraspinatus to contract and takes the pressure from the walls of the subdeltoid bursa by allowing relaxation of the deltoid muscles, thereby minimizing adhesions in this structure. When the arm is removed from fixation, we then have gravity assisting the strong adductors to bring the arm to its position at the side instead of what is usually the case, the weak abductors trying to overcome gravity as well as contracture in the adductors.

The difference in time lost controlled by these two procedures varies from three months to a year. The difference in permanent loss of use amounts to 50 per cent. of the arm if the arm has been immobilized at the side for any considerable length of time. We have seen many arms which should have had no disability so far as the results of the injury were concerned, but where there is an extremely serious disability of the arm due solely to long immobilization of the arm at the side.

LOWER LUMBAR INJURY WITH CALLUS FORMATION

J. C., male, aged thirty-six.

History of Present Condition.—A plank broke on a scaffold, thirty feet high, which let him fall a distance of nine feet, when he struck a cross beam, over the last four ribs on the right side. He fell from this plank to the ground, where he struck the back of his head and sacrum against the base of the smokestack

on which he was working. He got up and walked about twenty feet, then everything became black to him and he was unconscious for a period of approximately two hours. After four or five hours he felt well enough to walk a block and a half to a street car, on which he rode for about three hours to reach his home. The car stopped in front of his door; he got off and walked to his home, where he went to bed and remained in bed for four days. When he got up he had pain in the lower lumbar and sacral regions, especially in the right side. States he could not walk well. He tried to go back to work six weeks later, worked three days and became very much worse so far as his back was concerned. He rested for two weeks and tried to work again on several consecutive days, but had to give up on account of severe pain in the back. This process was repeated several times in the course of the following year.

Present Complaint.—Pain at the junction of the fifth lumbar and sacrum and the attachments of the right lumbosacro muscles. On motion he also has pain in the neighborhood of the tenth rib in the mid-axillary line, which is stabbing in character, brought on mostly by twisting or bending. He has headache on stooping, as well as backache.

Physical Examination.—Made December 2, 1919, twenty months after the accident. The man stands with increased dorsal curve, head forward, belly out, good lumbar curve, muscles well developed, back muscles flabby, both sides symmetrical. Lateral motion takes place above the third lumbar. Lifting the patient by the elbows, taking the weight off the spine gives relief from pain. Pressure downward gives sharp pain at the junction of the fifth lumbar with sacrum. Rotation to the left gives no increase of pain; rotation to the right gives increased pain. Pressure over the junction of the fourth and fifth lumbar with the sacrum gives pain, especially on the right side.

X-ray shows callus the size of a hazel nut to the right of the junction of the fourth and fifth lumbar. There is a long lateral process on the right side of the fifth lumbar vertebra which impinges on the ilium.

Neurological findings, made by Dr. Ralph C. Hamill, consulting neurologist, are negative, except as follows: "Does not show any marked functional trait, that is, there is no obvious attempt on his part to exaggerate his symptoms or enlarge upon his complaint. There is some allusion to the neglect of the company in failing to instruct the doctor in all his specific ills—the injury to his head, a slight injury to his arm and the injury to his back; and he points out the disastrous consequences of the doctor telling him to go to work, which he claims made him worse at each successive trial. In my opinion, there is present a certain amount of functional response to the accident; that is, the company is responsible and so must pay, is his idea.

"The character of the headache of which he complains on stooping over, makes it impossible to say that he has no headache at present. That the headache should be due to a fall eighteen months ago seems rather improbable; that is, in the absence of any organic signs or objective signs or organic disturbance, one must postulate a concussion and the headache as due to such concussion. Eighteen months is a long period of time for such headaches to persist. It is my opinion that the patient has magnified and is magnifying what actual disabilties there are; that these actual disabilities are not great. The X-ray of the skull shows no deformity."

From a neurological standpoint, there is no doubt that this man gives evidence of some functional trouble, but from an orthopedic or surgical standpoint, he gives absolutely no evidences of such trouble, because the troubles of which he complains can all be explained by the findings in the case, which were not known to the neurologist at the time he made his examination, which is noted here to call attention to the fact that the diagnosis of one specialist based on his findings alone is sometimes not accurate, in spite of the fact that that specialist is a well-qualified man and speaks truly from his standpoint.

In this case there is definite evidence that there was an injury to the lower lumbar spine. It is hard to believe that this man sustained an actual fracture at the time of the fall which formed the callus which is present and shown in the X-ray. (See Fig. 12.) Otherwise, it would not seem that he could, in the presence of this fracture, have endured walking the distance he did and ride subsequently for a period of three hours on a street car. It is, however, conceivable, not only conceivable, but possible, that this man severely traumatized the articular facets in the lower lumbar spine, at the same time tearing loose the attachments of muscles on the lamina, and also received an injury to fibres of the lumbo-sacral ligaments which tore loose periosteum which has since formed the callus that is apparent in the X-ray. That he has an inflammation now present in the joints of the lower lumbar spine is evidenced by the complete loss of motion in the lower lumbar spine. The fact that the individual claims that it gives complete relief from the pain when his weight is taken from these articular facets, the fact that the motion in work has repeatedly irritated the region and made the condition worse, would also point to an inflammatory process of both the articular facets and the ligamentous and muscular structures supporting this part of the anatomy. This man to me does not have any of the earmarks of the neurotic. He is matter-of-fact in his statements, and the fact that he returned to work on a number of occasions and tried to do his work would indicate that he was not a loafer. The man who starts out to malinger does not return to work or make any attempt to return to work from the day he is hurt, because his mind is made up on that subject at the time he was hurt, or soon after.

There is an interesting phase of this case noted in the physical examination—this man claims that when he rotates to the right there

is an increase of pain. It will be noted that the X-ray shows a long lateral fifth lumbar process on the right and a so-called partially sacralized fifth lumbar vertebra which is a structural defect and more easily injured than an upstanding fifth lumbar. When he rotates to the left he brings this process farther away from the external surface of the ilium; when he rotates to the right he forces the long fifth lumbar lateral process against the ilium, which increases his pain. It is a matter of common knowledge that these long processes in the lower lumbar region may be present for years without any symptoms, but that a sudden strain or wrench will develop symptoms which grow progressively worse. This seems to be analogous to the pathology of cervical rib, which undoubtedly has been present for a considerable length of time before it gives symptoms. The long fifth lumbar processes carried to a greater degree constitute the sacralization of the fifth lumbar, which is not unusual. The modifications in the anatomy of this region are extremely variegated and will be taken up in a future issue.

Treatment.—The treatment of this case should be as follows: Rest in bed with extension and counter-extension to relieve inflammatory process, which is here present. The man gives no indication at present of any focal infections, but this and the possibility of an intestinal toxæmia should be constantly kept in mind and if present obviated. After the pain and tenderness have been overcome by rest in bed and the lumbar curve kept relaxed by a small pillow between it and the bed for support, patient should be fitted with a Taylor spine brace, in combination with a Goldthwaite belt, a pad being placed over the sacrum and the fifth lumbar for immobilization of these parts, as well as support. After wearing this brace for six weeks to three months, massage should be instituted in conjunction with the application of dry heat to promote circulation and aid in restoring the structures to their normal tone. If these methods fail, it will be necessary to immobilize the lower lumbar and sacral regions by the use of a bone graft, which should be attached to the third, fourth and fifth lumbar spines, laterally, and set in a groove made for it in the sacrum, unless the spine of the sacrum is of sufficient length to fasten the bone graft to at that end.

Comment.—This long treatment would not have been necessary had a careful examination of this man's back been made at the time of

Fig. 13.

Before operation, showing width of head of metacarpal separating index and ring fingers

Fig. 13A

Full amount of flexion in fingers before operation

Fig. 14.

Palmar view of hand two weeks after head of metacarpal had been removed. The index and ring fingers will gradually approximate as the hand is used until the space will be almost obliterated.

Fig. 14A.

Full amount of flexion two weeks after head of metacarpal had been removed and flexor profundus digitorum and flexor sublimus digitorum tendons had been released from the scar and cut off inside their common sheath.

the injury and credence been given to his statements instead of assuming that because no blood was flowing that the man was not injured.

ADHESION OF ONE FLEXOR TENDON IN AMPUTATION SCAR

W. P., male, aged fifty.

History of Present Condition.—This patient suffered a crushing injury to the middle finger of the right hand, for which an amputation was performed at the metacarpo-phalangeal joint. The wound healed promptly and the amputation was done according to text-book practice.

Physical Examination.—Patient was examined on October 23, 1919. It was found that there was a limitation of motion in the index, ring and little fingers, amounting to about 75 per cent. (See Fig. 13.) Upon asking the patient to make a strong effort to flex these fingers, it was found that the branches of the flexor profundas and sublimus digitorum, supplying the middle finger, were firmly adherent in the scar; that it was possible to flex passively the other three fingers, but the man's own statement described the condition perfectly when he said: "There is something sticking where the finger is cut off." It was apparent that the adherent ends of these two tendons were limiting the possibility of motion in the branches which supplied the other three. The mechanical principle of this is plain, inasmuch as one muscle is pulling here from four tendons, the fixation of one branch of one of these tendons which is only one branch of the muscle, would limit the length of pull of the other three branches.

It was advised that the head of the metacarpal of the middle finger be removed to allow the index and ring fingers to come closer together, thereby giving a lesser deformity, making the amputation less apparent, and at the same time to sever the two tendons caught in the scar above the point of the adhesions, and, if possible, within their common sheath, so that they would slide freely when the other three branches moved.

Operation.—This was done, with the result that the following day after the operation, patient was able to flex the other three fingers voluntarily a full 50 per cent. more than he had before the operation. (See Fig. 14.)

Comments.—Removal of the metacarpal head allowed a narrowing of the hand so that in a few months from the time of the operation the deformity in the hand will be much less apparent than if the metacarpal head had been allowed to remain in place. The removal of the metacarpal head, if the finger must be amputated at its base, does not increase the disability of a hand or in any way reduce its strength inasmuch as the interosseii and the lumbricales are in no way interfered with and it does leave a better looking member than where there is a wide gap between the fingers.

Surgery

SURGICAL DISEASES OCCURRING IN CHILDHOOD

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I. Omental Cyst, Strangulation from Twisted Pedicle.
II. Lymphangioma of Axilla.
III. Congenital Elephantiasis of Scrotum.
IV. Traumatic Rupture of Jejunum without External Wound.

I. CYST OF OMENTUM WITH TWISTED PEDICLE

The patient, a boy five years of age, was admitted to the Children's Hospital November 14, 1919, with the history of sudden severe pain in right side of abdomen, beginning twenty-four hours before admission. The child, previous to this attack, had always been well. The abdomen was tender on palpation, bowels regular, no vomiting.

At the time of admission the abdomen was distended, there was slight rigidity of the muscles and tenderness was noted on the right side and, at times, over the appendiceal region. Peristaltic sounds were not heard. W.B.C., 20,000; polymorphonuclear cells, 80 per cent.

A diagnosis of appendicitis was made and the abdomen opened through a right rectus incision. The appendix was not inflamed, and on further examination a cyst (Fig. 1) was noted in the upper quadrant of the abdomen attached to the right margin of the greater omentum. The pedicle contained several twists, the cyst itself lying in the coils of the small intestine, was not adherent and was removed after ligation of the pedicle. The abdomen was closed without drainage. The child was in a favorable condition the morning after operation, but later developed a weak, irregular pulse, vomiting, dyspnœa and died from what appeared to be a condition of acidosis. An autopsy, limited to an examination of the abdomen, revealed no evidence of infection, but the presence of numerous cysts about the size of a

walnut. The majority of the cysts were in the gastro-colic omentum, a few in contact with the stomach wall, and some located posterior to that organ. Along the lesser curvature of the stomach several smaller cysts were noted. The appearance was uniform, consisting of a thin-walled sac beneath the peritoneum, containing clear fluid, the cysts being separated from one another by a thin septum.

Pathological Examination.—The omental cyst contained 36 c.c. of amber-colored, slightly cloudy fluid; specific gravity, 1040; cell count, 200 per c.c.; the majority of the cells being lymphocytes, many cholesterin crystals were present. The high specific gravity probably was due to the inflammatory reaction incident to the twist of the pedicle.

The cyst, elliptical in shape, measures 8 cm. long, 6 cm. wide and 2 cm. in depth. Attached to the upper pole is a portion of omentum which, extending over the side of the cyst, is drawn out in the form of a distinct pedicle and contains several twists. The cyst is purplish black in color, both the internal and external surfaces are smooth, transparent, of the thickness of peritoneum and contain numerous dilated vessels.

Microscopic examination of the cyst wall shows a lining on the outer surface composed of flat cells resembling endothelium. The interior of the cyst shows, in some areas, a lining similar to the above, but in many places the lining cells have disappeared. The wall itself is composed of a fibrous stroma in which considerable hemorrhagic extravasation and many leukocytes appear. The blood-vessels are engorged, there are also numerous spaces lined with endothelium. Some of these are dilated, some collapsed, while others contain blood, apparently the result of the extravasation.

Microscopic examination of one of the small cysts removed from the gastro-colic omentum shows a very delicate wall which contains an endothelial lining, the wall itself being composed of a fibrous stroma. Toward the base of the cyst where a portion of the omentum has been removed are numerous lymphatics. The lining of these is composed of endothelium, some of the vessels show considerable dilatation and contain small amounts of homogeneous material characteristic of lymph. Similar spaces are found in the thicker portions of the cyst wall.

The microscopic examination indicates that the omental cyst and the smaller ones were derived from lymphatic vessels. It bears a

marked resemblance to the cases reported by Stillmann, who regarded the smaller elongated cysts situated in the gastro-colic omentum as dilated lymph vessels. The smaller cysts in the author's case were round and not elongated, otherwise their characteristics were the same.

In discussing cysts of the abdominal cavity, Dowd (*Annals of Surgery,* 1900, xxxii, 515) states that the term mesenteric is generally used in describing cysts within the mesentery, mesocolon, mesorectum or omentum, and that there is a distinct advantage in this use of the term, since these regions, as well as the cysts they contain, are anatomically similar. Cysts, almost entirely retroperitoneal, have been termed mesenteric.

There are numerous classifications of cysts in this situation; Moynihan (*Annals of Surgery,* 1897, xxvi, 1) groups them as follows:

1. Serous cysts,
2. Chyle cysts,
3. Hydatid cysts,
4. Blood cysts,
5. Dermoid cysts,
6. Cystic malignant disease.

It may be profitable to give the conclusions reached by Dowd as to the derivation of each of these varieties, for there has been much confusion and no uniformity in classification and but little effort made to explain the origin of these cysts. Certain of the more unusual types are undoubtedly embryonic in origin and result from the development of ovarian rests in the mesocolon.

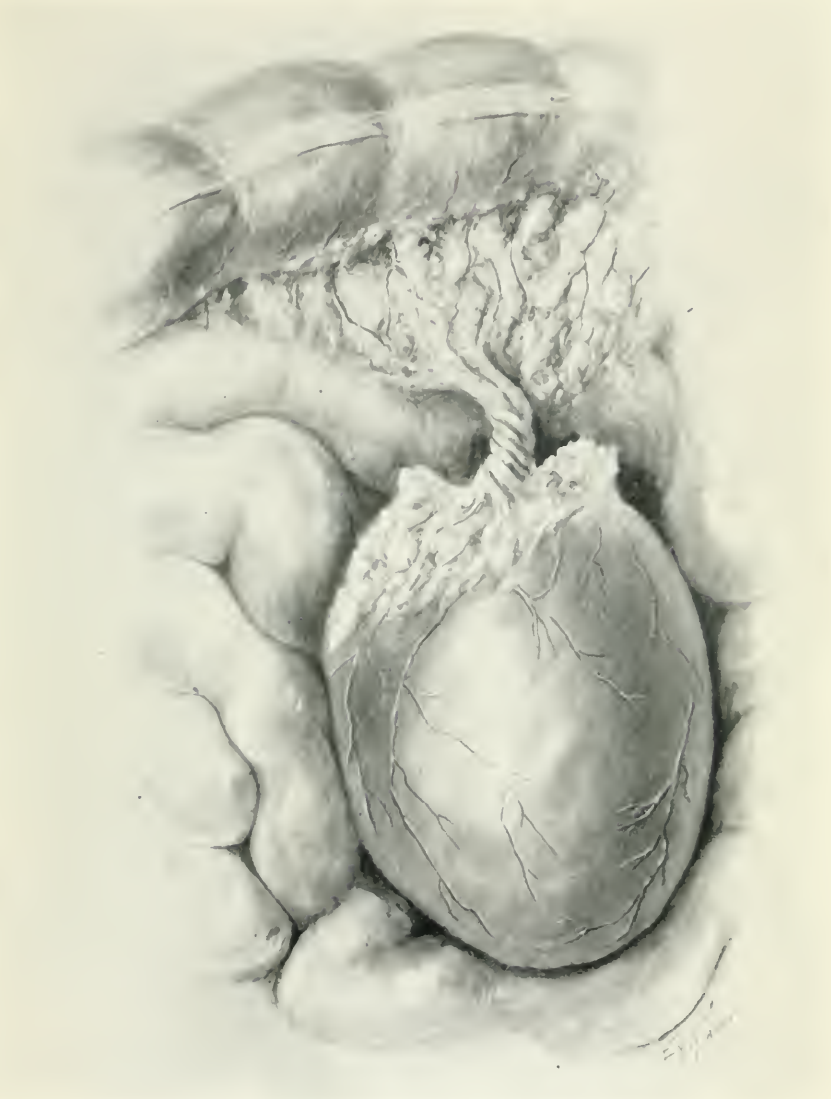
Chyle cysts are really preformed cysts situated in such close relation to the lacteals that chyle has been effused into them. They are believed to be embryonic in origin, of structure similar to ovarian and parovarian cysts.

The origin of the dermoid cyst can, of course, only be explained by embryonic misplacements.

Blood cysts should be classified according to the structure of their walls and chemical character of the fluid they contain. Hæmatoma in the mesentery should be considered as such. Trauma almost always precedes the so-called blood cysts, and although cysts may develop from the hemorrhagic extravasation, the classification of blood cysts need not be used unless further observation should make it desirable.

Serous cysts: The incomplete descriptions of many cases make it

Fig. 1.



Cyst of omentum.

difficult to properly classify many of them. The cases correspond closely to the forms of ovarian and parovarian cysts, which contain serum, the fibrous walls and serous fluid being elements upon which this similarity rests. Dowd believes they can with propriety be considered as of probable embryonic origin. It is worthy of note that most of the serous cysts occur in the omentum, the intestinal edge of the mesentery, mesocolon or in the retroperitoneal region, while cysts in the mesentery, except at the intestinal border, usually contain chyle.

Under the term omental hydrocele, Bland-Sutton ("Tumors Innocent and Malignant," p. 710) describes the production of cysts. Under normal conditions the lesser cavity of the peritoneum extends into the great omentum; occasionally this space becomes distended with fluid, and its communication with the upper area of the lesser cavity becoming shut off, the omental space is isolated and converted into a cyst.

The fluid in the serous cysts is uniformly characteristic, being pale, clear, straw-colored, specific gravity 1015–1016, contains a large amount of albumen, and is alkaline in reaction (Moynihan).

In considering the etiology, therefore, of most cases of true cyst formation, hydatid disease, cystic malignant disease, blood cysts following hæmatomas and sacculated collections following rupture of an abdominal viscus, are to be excluded.

Allusion has already been made to the probable embryonic origin of these cysts. A number of authors, including Jacobi (*N. Y. Medical Jr.*, 1901, lxxiv, 97), believe that all true omental cysts are lymphatic in origin. Hasbrouck believes most of them to be endotheliomata and disbelieves that many have a congenital origin. According to Stillman (*J. A. M. A.*, 1911, lvii, 726), it is significant that the swelling of the abdomen was first noticed at some period between the ages of one and ten in fifteen of twenty-one cases operated upon, and in ten of these, or nearly half of all cases he collected, the swelling was noticed between one and four years of age. Such facts point to a congenital origin.

Outerbridge (*Annals of Surgery*, 1914, lx, 680), in summing up the question of derivation, says that while the possibility of the origin of some cases of true cysts of the omentum from embryonical rests, or from the surface peritoneum, cannot be denied; it may be considered demonstrated beyond any reasonable doubt that in other instances the lymph vessels are the starting point of such growths, and this latter

explanation would certainly appear to be the one which would apply in the majority of cases.

Of the total of forty-six cases of omental cyst formation of all kinds, Stillman found but twenty-two to be true serous cysts. Of these nine occurred between one and four years of age, six between five and eleven, the others at the ages of seventeen, nineteen, twenty-two, thirty, forty-two; in two adults the age was not stated. Sixteen occurred in females and six in males.

The relative infrequency of this affection and absence of characteristic symptoms makes the diagnosis difficult; in fact, the true nature of the affection has only been discovered at operation in many cases. In large cysts with thin walls the condition has not infrequently been mistaken for ascites, and in not a few of the recorded instances the abdomen was tapped for the relief of this condition. In many cases the presence of a tumor has been the guide to operative procedures, and in some patients acute conditions developing in the cyst have called for surgical intervention. Among these complications may be mentioned the author's case of twisted pedicle with symptoms suggestive of appendicitis. A case somewhat similar is recorded by Legardi-Laura (*Med. Record,* 1913, lxxxiv, 205) in which a lipoma attached to the omentum by a pedicle, underwent tortion of the latter and produced symptoms of appendicitis.

Suppuration developing in an omental cyst is mentioned by Jessett (*Brit. Gyn. Jr.,* 1896, xii, 156), and the occurrence of gangrene is reported by Edibohls (*N. Y. Jr. of Gyn. and Obstet.,* 1893, iii, 614). The cyst presented the ordinary characteristics of an ovarian cystoma, but both tubes and ovaries were found to be normal and not connected with the cyst. The tumor was attached to the omentum by a short pedicle ten centimetres wide and two centimetres in thickness. The cyst wall was gangrenous over a circular area, 12 cm. in diameter, that portion of the wall most distant from the pedicle being involved in the process of mortification. There was no twisting of the pedicle and no history of trauma. The gangrene was probably due simply to insufficient nutritive supply from the poorly vascularized edge of the omentum.

The treatment of omental cysts is, of course, operative and consists in simple removal of single cysts, or as much of the omentum as may be necessary when multiple cysts involve this structure. While

tapping has been mentioned frequently in many of the older case reports, it is doubtful if this is justifiable at present as operative interference has given uniformly good results.

II. LYMPHANGIOMA OF AXILLA

The patient, a girl, one year of age, was referred by Dr. Charles Sanderson for a swelling of right axilla, which was noted by the mother one week previously. The enlargement occupying the axillary space was soft, fluctuating, tender and slightly reddened. Movements of the arm seemed to cause pain. Temperature 99° to 100° F. There was no history of trauma nor any demonstrable focus of infection. Family history negative.

The acute onset and inflammatory symptoms led to the diagnosis of an abscess, and the axilla was opened under ether anæsthesia. At once several large cystic spaces were noted, and on dissection a tumor (Fig. 2, Frontispiece) about the size of a small apple was exposed. The mass extended downward between the scapula and chest wall, and was surrounded by a dense capsule from which it was separated with some difficulty. Two small branches of the axillary artery were ligated in removing the tumor. The wound healed promptly, although slight œdema developed in the vicinity of the wound, due evidently to cutting off the lymphatics in the region.

Pathological Examination.—The specimen consists of an irregular mass measuring 6 x 5 x 4 cm., surrounded in part by a dense fibrous capsule, to which is attached irregular tabs of fat. In the areas in which the capsule is deficient numerous large and small cysts are seen, they are blue in color, without communication and contain dark blood-stained fluid.

Microscopic Examination.—The cysts are seen to consist of spaces lined with a single layer of endothelium, some containing a homogeneous structureless material taking an eosin stain and others being filled with blood cells. The large cysts seem to be independent, although communicating spaces exist between some of the smaller ones. The stroma, consisting of dense fibrous tissue, contains numerous small blood-vessels and many small collapsed capillary-like structures. The tissue contains many cells and small collections of leukocytes.

Diagnosis.—Lymphangioma.

This instance of a congenital formation also is associated with the lympahtic system, the growth belonging to the lymphangiomata. These tumors, generally congenital, develop slowly, may be multiple, and are most commonly encountered in the skin, subcutaneous tissues, deep areolar tissues and muscles of the neck, trunk, lips, tongue, eye and orbit and mediastinal and retroperitoneal regions (Ewing).

The lymphangiomas are encountered as a simple form in which the vessels are but slightly dilated, such changes as occur in the case of elephantiasis to be described. Other varieties mentioned are lymphangioma cutis circumscripta, occurring as small elevated vesicopapules containing a new formation of lymph vessels, the process being a neoplasm.

The congenital cystic lymphangiomata of the neck has been classified by many among the cavernous lymphangiomas. In Busey's summary of the condition he found that such formations occur most frequently in females, has usually been observed in immature children and generally complicated with other malformations. It has been asserted by some that the cysts find their origin in congenital dilatation of lymph vessels.

The cavernous lymphangiomas are most frequently seen in the lip (macrocheilia), cheek (macromelia) and tongue (macroglossia). At times, definite cysts are formed in lymphangioma, such cases being of congenital origin in most instances. When seen in the cervical region the name hygroma cysticum colli has been given to these growths, which consist of multiple cysts lined with endothelium. The cysts may be independent of one another, being separated by a thin septum, in some cases they have well-defined communications. As the tumor enlarges, its prolongations extend between the various important structures of the neck, such extension being well shown by the prolongation between the scapula and the chest wall in the case reported. In many instances the tumor mass is removed with difficulty, because it does not contain a definite capsule, although the condensation of the surrounding tissues serves to localize the process to some extent and make its removal more readily accomplished. Although cystic lymphangiomata are not definitely encapsulated, they do not infiltrate surrounding parts as in true malignant disease.

The clinical symptoms worthy of note are the presence of a tumor, fluctuating in character, more or less tense and covered by a thin,

freely movable skin. On pressure there is no appreciable diminution in size of the tumor, which, if present at birth, slowly enlarges until it reaches large proportions within a few months.

The majority of writers on cavernous lymphangioma of the neck allude to its situation in various parts of this region, but few references are made to its situation in the axilla, so that the case reported is more or less unique as to its situation.

Radical excision of the cases occurring in the cervical region is often difficult on account of the large size of the tumors, and, if undertaken, is attended with much risk on account of the early age in which these cases are encountered. The growths met with in other situations are apt to be more circumscribed, surrounded by less important structures than in the neck, so that operative interference may be carried out with less danger to the patient.

III. CONGENITAL ELEPHANTIASIS OF THE SCROTUM

The patient, one year of age, was admitted to the Children's Hospital for an abnormality of the scrotum, which was noticed first by the mother a short time after birth. The child is breast fed, normal at full term, has always been well and seems perfectly normal with exception of the scrotal lesion. The parents are healthy, free from congenital defects, one other child is living and well.

The condition has been progressive in its growth; there has been no evidence of inflammatory attacks. The scrotum on the right side shows a pronounced hypertrophy of the skin, which is greatly puckered and lies in folds, the enlargement being several times the normal dimension of the scrotum (Fig. 3). The hypertrophic condition of the skin is limited by the rhaphe, except at the fundus, where the left side of the scrotum is involved. The prepuce is long and adherent; testicles lie in upper portion of scrotum below the external rings. There is no enlargement of the inguinal lymph-nodes and no swelling in this region.

Operation.—Plastic removal of all involved skin tissue on both sides, the skin remaining being sufficient to form a new scrotum. Circumcision. Healing by first intention. Nine months later, when the child was examined, there was no recurrence of the condition, the scrotum is normal in appearance and the general health and development satisfactory.

Pathological Examination.—Specimen consists of a mass measuring 7 x 4 x 2 cm. The external surface is arranged in folds, the entire specimen contains eight distinct transverse folds and presents many irregularities between. The inner surface consists of a dense fibrous stroma.

Microscopic examination shows a skin surface containing many indentations. The papillæ are smaller than normal and many are decidedly atrophic in appearance, and in some places the papillæ disappear. The subcutaneous tissue is composed of a loosely arranged stroma in which elastic fibres do not occur. Remnants of the dartos muscle are seen, the muscle fibres are more or less broken up by the overgrowth of fibrous tissue, which also compresses the few glands which are present. Numerous blood-vessels are seen, some being filled with blood, others are dilated and empty. In addition to the well-defined vessels there are numerous spaces containing an endothelial lining, having the appearance of slightly dilated lymphatics.

By elephantiasis, Matas (*American Journal Tropical Diseases,* 1913, p. 60) defines a progressive histopathologic state or condition which is characterized by a chronic inflammatory fibromatosis or hypertrophy of the hypodermal and dermal connective tissue, which is preceded by and associated with lymphatic and venous stasis, and may be caused by any obstruction or mechanical interference with the return flow of the lymphatic and venous currents in the affected parts. In order to bring about the hypertrophy of the connective tissue, which is the distinctive feature of the true elephantiasic state, the mechanical obstruction of lymphatic and venous drainage is not sufficient, as this by causing lymphœdema will not produce the characteristic fibromatosis. This, in turn, is induced by infection with pathogenic organisms and especially those of the streptococcal type.

The association of infection was not established until Sabourand published the results of his studies in 1893. In a series of five cases, he was able by scarifying the skin of elephantiasic patients, during erysipelatous attacks, and by making cultures of the blood and serum thus obtained, to demonstrate pure cultures of streptococci. All cultures taken between the inflammatory attacks were sterile.

The histopathological elements which Matas believes to be essential to complete the picture are (1) a mechanical obstruction or blockade of the veins and lymphatics of the part, usually a thrombophlebitis or lymphangitis or adenitis; (2) hyperplasia of the collagenous

Fig. 3.

Congenital elephantiasis of scrotum.

connective tissue of the hypoderm; (3) gradual disappearance of the elastic fibres of the skin; (4) the existence of a coaguable dropsy or hard lymphœdema, and (5) a chronic reticular lymphangitis caused by secondary and repeated invasion of pathogenic microörganisms of the streptococcal type.

Clinical observation has shown that if a lymph scrotum develops as a consequence of malarial obstruction, it only becomes an elephantiasic scrotum when repeated attacks of erysipelatous infection follow in the wake of the mechanical stasis and in this way starts the fibromatous process which is the histologic essential of elephantiasis.

According to Ewing ("Neoplastic Diseases"), it has been long recognized that a close connection exists between multiple tumors of the nerve trunks and some forms of elephantiasis. The nature of the relation is ill-defined but is strongly suggested by the occurrence of multiple fibromas in many cases of elephantiasis, by the hereditary and congenital character of both conditions, and by the occasional presence in both of pigmentary changes in the skin, and by the partial histologieal resemblance of the structure of the affected tissues. The result of recurrent inflammation and lymph stasis are the two main factors which separate non-parasitic elephantiasis from fibromatosis.

Diffuse fibromatosis affects the skin over large areas, as an entire limb, or it may occur in a more circumscribed form when its neoplastic characteristics are more distinct. The early or congenital forms produce a soft mucinous thickening, whereas in the forms beginning later the tissues are firmer or sclerosed.

In many instances there is a definite history of inflammatory attacks, resembling erysipelas, the skin becoming red and swollen, and enlargement of the inguinal lymph-nodes developing. These attacks, accompanied by fever, are recurrent in nature, and are followed by infiltration of the scrotal tissues, which with its accompanying lymph stasis and connective tissue hyperplasia, is held responsible for certain cases of scrotal elephantiasis. But there are many cases in which there is no history of inflammation, so that other etiologic factors must be sought for.

The term elephantiasis is also applied to the large massive hypertrophies of the skin forming pads, folds or flaps, occurring about the face, neck or chest (V. Bergmann, Vol 1, p. 505). Elephantiasis congenita nervorum or neuromatosa corresponds to all tumors and thickenings of the skin which result from fibrous degeneration of

nerve branchings. All these forms stand in close relation with each other and with the same disease of nerve trunks, the so-called general neuromatosis. It is likely that a congenital disposition must always be assumed, for larger tumors generally develop from small skin fibroids or beneath moles limited in size which were present at birth. Ewing mentions instances of myomas occurring in the skin and cites cases seen in early life and an instance of a congenital lymphangiectatic myoma.

Syphilitic lesions involving the scrotum may produce the appearance of elephantiasis. McDonough (*Brit. Jr. Dermat.,* 1912, xxiv, 24) records such a case in an adult; the swelling appeared to be in the skin, which was hard, barely œdematous and retained its rugose appearance. Syphilis as a direct cause of elephantiasis is seldom described, and is regarded as a diffuse syphilitic infiltration of the cutis and subcutis arranged chiefly around the lymphatics—a syphilitic lymphangitis. The case is important in that it shows that elephantiasis can occur in syphilis apart from streptococcic infection.

The congenital forms, according to Kuhn (*Med. Press and Circ.,* March 7, 1906, p. 246), usually begin with chronic œdema and other anomalies in the circulation, which expose the tissues to any infecting agent, as streptococci, which set up chronic inflammatory thickening.

There are several important varieties noted by Shattuck (*Boston Med. and Surg. Jr.,* 1910, clxiii, 718). One of the congenital forms involves the whole body and occurs generally in acephalic monsters, and is due probably to a congenital defect of the lymphatic system. The cases are further divided in groups corresponding roughly to etiology, the congenital, the sporadic and the endemic. The congenital cases present great variety. A few resemble so clearly the common acquired forms as to suggest a similar etiology. There is reason to suppose that congenital weakness or anomalies of the lymphatics may play an essential part in the production of some cases of elephantiasis, and that such weakness or anomalies can be inherited.

In elephantiasis of the genitals, erysipelas and attacks of inflammation involving the lymphatics have been rarely observed, never in cases attacking the scrotum (Busey, *Am. Jr. Obstet.,* 1877, x, 1). The congenital forms may involve an entire extremity, or may be seen at many places on the body surface, either in the form of regular enlargements involving a portion of an extremity or of the trunk, or in the form of tumors, either solid or cystic.

From the above brief review of the etiology of elephantiasis, non-parasitic in nature, it is seen that a variety of factors may play a part in the development of the condition. In congenital cases, such as the one reported, and particularly when the scrotum is involved, an inherited defect of the lymphatic system in all probability exists. The factor of streptococcal infection, so common in the acquired variety, is not always noted in this situation, a fact shown in the history of the case recorded.

IV. TRAUMATIC RUPTURE OF JEJUNUM WITHOUT EXTERNAL WOUND

The patient, a girl, aged eleven, was admitted to the Presbyterian Hospital, on October 30, 1919, 6 P.M., with the following history: While returning home yesterday at 6 P.M., she was struck in the abdomen by a shovel handle wielded by a small boy. The force of the blow knocked her down and she had to be helped home. About 8 P.M. she began to vomit; no blood was noticed in the vomitus. She had fever, was delirious and awake practically all night, vomiting every hour or so if she stirred. Urine was voided twice and was clear. Bowels have not moved since yesterday morning.

The patient has had the usual diseases of childhood and four years ago was treated for an attack, diagnosed as appendicitis, but was not operated upon.

On examination the abdomen was found to be rigid; there was marked generalized tenderness and slight dulness in the flanks on percussion. The leukocyte count was 16,000. The case was regarded as an intra-abdominal injury and operation performed shortly after admission, or thirty hours after the injury was inflicted.

Operation.—A right rectus incision disclosed a small amount of dark cloudy fluid in the abdomen, the appendix was moderately inflamed but not sufficiently so to account for the fluid present. The small intestine was then examined and a perforation found in the jejunum four inches from the duodeno-jejunal junction. The opening measured 2.5 cm. in diameter, was round and was located on the lateral surface of the bowel. Closure was made with a double row of silk sutures. Although there was relatively little fluid present, in view of the length of time elapsing from the injury, a rubber tube was inserted in the pelvis. The patient made an uninterrupted recovery and was discharged three weeks later.

Cases of this type are not infrequent, and they present certain interesting features from the standpoint of diagnosis and cause. Of the many cases reported in the literature it has been noted that comparatively few recover after septic infection has gotten a start, so that the wisdom of operating, even in doubtful cases, at once becomes apparent.

Battle (*Lancet,* July 19, 1919, 1031) has recently discussed the subject of these injuries and noted that many cases do not exhibit the leading symptoms of intestinal perforation until several hours have elapsed, and then rapid change takes place.

He calls attention in particular to two facts: (1) the occasional rise in temperature to 103° F. or over, when other symptoms are not well marked, a symptom regarded as indicating a definite lesion of the wall of the gut, and one which requires operative measure for repair of the injury. While the lumen may not be exposed and only the external coats of the bowel involved, later on the perforation may become complete. (2) The abdomen is immobile, due to rigidity of the muscles, tenderness is great and seldom is dulness found in the flanks, and when present is due to hemorrhage from laceration of mesentery, liver or spleen.

The presence of gas, even in small amounts, appears to be rare. Loss of liver dulness usually indicates a late stage and should be regarded as an unfavorable prognostic sign. In traumatic rupture there is collapse of the gut near the laceration and the intestinal contents are therefore less liable to escape than in pathological perforations.

Battle alludes to two hundred and twenty-one case reports occurring in England, of which two hundred were males and twenty-one females. At St. Thomas's Hospital forty-three cases have been recorded; there were thirty-three operations and eleven recoveries. Of the general series of one hundred and twenty-four operations there were forty-eight recoveries and seventy-six deaths. The lesion was found in the duodenum thirty-two times; jejunum, one hundred and eleven; ilium, fifty-nine; small intestine, two; large intestine, eleven; and the force variously described as being run over in street, kick on abdomen, crush, struck by moving body, falls and of fall of weight on body.

The relation of cause to the site of rupture is discussed by Stanley (*Lancet,* October 25, 1919, p. 726), and this obviously must be force

applied to the abdomen or chest, as probably no traumatism from within would burst the gut. More important than the nature of the blow is its velocity, on which depends the length of time during which the force is applied and thus the rapidity of compression of the abdomen. If the rate of compression is rapid the abdominal muscles have no time to contract and protect the abdominal contents, and moreover the gut cannot slip away.

The intestine nearest the abdominal wall at the point struck is usually the coil to rupture, and as the first few feet of the jejunum and the last few feet of ileum are usually in this position, they are thus predisposed to rupture. The mechanism described by Stanley is simple. If the abdomen is struck above the umbilicus, the force is transmitted to the first few feet of jejunum. The mobility of this coil allows it to be pushed until it is checked by the vertebral column, and between the latter and the moving body, it is crushed and ruptured. A parallel situation occurs at the ileo-cæcal junction.

In addition to the above factors, Lindop (*Lancet,* November 15, 1919, p. 811) thinks two other factors play a part in the rupture: (1) hydrostatic pneumatic effect and (2) kink.

The small gut contains fluid and gas, so that any sudden violent compression applied to the abdomen tends to force fluid and gas out of the coils. This force, acting on the fluid and gas in a tube, acts equally and in all directions and at first tends to balloon the tube. If the ends are unobstructed, the contents are forced, aided by elastic recoil of the tube in the direction of its length, and this goes on until the contents slow up against the kink, where the resistance is absolute. The pressure communicated in the case of a full tube, or actual movement of contents in one collapsed, accentuates the kink. The tube balloons and ruptures at its unsupported margin.

In rupture of the intestine a small rent indicates gas and a large one fluid contents. Gas is compressible, but fluid, for purposes of this tube, absolutely incompressible. In case of a full tube there is no actual movement of contents, only transmission of force. Rupture is more serious in the upper part of the intestine, as there is more fluid and less gas, and the effects of sudden pressure are much more smashing on a tube distended with fluid than one distended with gas. In the lower part of the intestinal tract, any distention is caused by gas and the effects of sudden pressure are less noticeable, and there are no kinks except at the ileo-cæcal junction.

THE TREATMENT OF HEMORRHOIDS UNDER LOCAL ANÆSTHESIA

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I have chosen this subject because hemorrhoids occur under very different conditions and in all classes of patients. Many methods have been devised for relieving them, and each method has its advantages in well-selected cases. Your treatment is half done when you select your case, determine its proper treatment and know what results to expect. The reason you treat so few rectal cases is not that they are infrequent but rather that your patients do not wish to take a general anæsthetic and be confined to bed. Patients suffering with piles are prone to use domestic remedies and nostrums until they are physical wrecks from loss of blood and pain—all the time refusing an operation.

Once the tumor has formed, subsequent inflammation will produce a hyperplasia of the connective tissue about the veins, and there is no possibility of the tumor being absorbed, but must be removed surgically. There are some cases of hemorrhoids which had better be operated upon under a general anæsthetic when other surgical conditions need attention, but most hemorrhoids may be satisfactorily operated under a local anæsthetic, causing but from a few hours to two days detention from business, and also eliminate the danger of a general anæsthetic to life from heart, lung or kidney complications and lessen the pain and danger of secondary hemorrhage due to vomiting. A local anæsthetic has a distinct advantage in aged, timid or nervous patients.

The anus is one of the most difficult regions to satisfactorily anæsthetize. Nerve-blocking operations are difficult because of the many filaments from a number of sources. This region is exceedingly sensitive and the position of the patient, who is furthermore apprehensive and restless, adds to the technical difficulties of the operator. An intimate knowledge of the local anatomy, its nerves, muscles and blood-vessels is important. The external sphincter is the most important vessel, and its location and size must be studied. The sympathetic nerves descend within the rectal wall and are sensitive to traction,

even though the hemorrhoidal and coccygeal nerves be well anæsthetized. The operator should also bear in mind the individual contraindications to the employment of a local anæsthetic, such as highly nervous or hysterical patients, or an idiosyncrasy of the patient to the drug employed and the preparation for the operation should include having on hand the antidote for the anæsthetic drugs employed, although I have never seen any untoward symptoms since using the following technic. The surroundings of the operating room, together with the nature and extent of the operation and the probable time it will require must all be carefully considered.

Operation.—The patient is as carefully and thoroughly prepared for a hemorrhoidal operation as for a laparotomy. The bowels are thoroughly emptied with a laxative the day before the operation, and from this time on the diet is moderate in amount and absorbable. The night before the operation the peri-anal region is shaved and thoroughly cleansed and a sterile dressing applied. Three hours before operation the patient is given a one-pint enema. One hour before the operation he should have a cup of soup or milk, as it is better not to operate on an empty stomach. He is given a hypodermic injection containing morphine, gr. ¼; hyoscine, gr. 1/100, and atropine, gr. 1/150, and visitors should leave him. The operating room should be fully prepared before the patient is brought in, so that no unnecessary disturbances arouse him. Strict silence should be observed by all in the operating room. The table should be covered with a thick pad, and the patient should be provided with a pillow to help make him comfortable. Always remember that he is not anæsthetized and every sound and touch is appreciated by him. He should, therefore, be handled as little and as carefully as possible, not tied or strapped in any way, the left lateral prone position with the hips raised (the proctologic position) is satisfactory for the surgeon as well as the most comfortable for the patient and prevents the sacro-iliac strain which so often is caused by the lithotomy position. I use one-half of one per cent. solution of novocaine for infiltration of the skin, thus permitting a liberal amount to be used without danger of toxicity, as novocaine is but one-seventh as toxic as cocaine. Quinine-urea solution is not used for the skin, because its injection is painful. The success of a local anæsthetic depends upon a careful and thorough infiltration of the whole field. I use a 26-guage needle. A 30-c.c.

syringe is filled with warmed anæsthetic solution. The skin in the posterior raphe one inch back of the anal margin, where the skin is less sensitive, is touched with phenol on a swab and after waiting a few minutes the skin is picked up between the thumb and forefinger of the left hand and the needle introduced at the cauterized spot. A few drops of novocaine solution injected here causes a wheal to arise and after waiting a few moments the needle is advanced and another wheal made while the needle is carried forward just under the skin at a distance of one-half inch from the anal opening. When the needle has been advanced its full length on one side, it is retracted to the posterior commissure, but not withdrawn from the skin and the infiltration carried up on the other side of the anus. When the full depth of the needle has been reached on both sides of the anus, it is withdrawn and inserted at the most anterior wheal just made, and the infiltration continued to the anterior commissure and around on the opposite side until the wheals meet those previously produced. In this way the whole anal opening is anæsthetized, while the needle is always kept one-half inch out from the edge of the mucous membrane. This procedure blocks the inferior sphincteric nerves. The mucous membrane of the anus is next anæsthetized by placing a pledget of cotton wet with 10 per cent. solution of novocaine into the grasp of the sphincter. Wait ten minutes for anæsthesia to be complete and then introduce the left index finger into the rectum above the external sphincter, hook the finger over the muscle and by slight traction draw it down and steady it while the needle passed through the skin at the anæsthetized bullea is plunged into the sphincter muscle and 20 minims of the novocaine solution is deposited in the substance of the muscle. This deep injection is made in four places, one on either side of the commissures, one-half inch out at the entrance of the lesser sphincter nerves. The index finger within the anus will assist in guiding the needle to the proper depth, and will be felt under the rectal wall. A 10-centimetre needle, long enough to easily reach all of the deep layers of the sphincter muscle, is required, as otherwise dilatation of those fibres will be painful and incomplete. As the needle is being carried down to the sphincter, the anæsthetic solution should be slowly infiltrated, so that some distention of the tissues will precede the needle point and avoid pain.

A syringeful of fluid is now deposited immediately in front of

the tip of the coccyx to block the coccygeal nerves and thus further facilitate dilatation. This infiltration procedure consumes fifteen to twenty minutes and must be carried out carefully until anæsthesia is complete. Then the finger within the rectum massages the sphincter, and if the muscle has been well injected it will soon relax, but if not sufficiently anæsthetized will contract upon (bite) the finger, and we must wait longer. Never begin manipulation, pinching or operating until anæsthesia is complete. This applies with equal force to local and general anæsthesia. As the sphincter relaxes under the massage, a second finger of the same hand is introduced, and if needed a finger of the other hand, and the massaging and stretching continued until the capacity of the sphincter is reached. This manœuver must be carefully performed that the mucous membrane is not torn or the anal margin not otherwise damaged. Just what is the full limit of the sphincter varies with individuals and the operator's experience is the criterion in each case. By this method there is never any danger of rupturing the muscle as may occur under divulsion with the speculum. This slow but thorough dilatation of the sphincter is an essential factor in lessening the post-operative pain by avoiding sphincteric spasm. If the hemorrhoids have been habitually prolapsing, the sphincters will be found relaxed and will not need much dilating. Abscess following a hemorrhoid operation usually results from trauma during the dilatation of the sphincter (most likely to occur if the stretching is hurriedly performed), a perirectal blood-vessel being ruptured, and this resulting in a hæmatoma, which later becomes infected and thus causes a perirectal abscess.

When the muscle has been thoroughly relaxed, it will so remain while we are operating. The hemorrhoids and the anal mucous membrane prolapse well into view under this treatment, and the whole pile can be seen and reached. Although prolapsed, internal hemorrhoids may be operated without dilatation of the sphincter, I always make this procedure part of my technic, because without it there is very liable to be some part of the pile remain internal to the sphincter and will cause a recurrence at a future time. Therefore, even if the hemorrhoid is within reach without dilatation, the sphincter should be stretched that all hidden nodules may be found. Also, if the stump retracts above a tight sphincter, a subsequent hemorrhage might not be detected for some time. Take plenty of time in making the dila-

tation, because prolonged relaxation cannot be obtained if the stretching is roughly or hurriedly performed. Having opened the anus and brought the hemorrhoid well outside, it is now infiltrated with a solution of one-half of one per cent. of quinine and urea hydrochloride, using enough solution to distend the tumor thoroughly. The pedicle of the tumor should be injected and also the normal mucous membrane for one-half inch above the pile, as otherwise traction on the pile in handling will cause pain by stretching the sympathetic nerves which come down the rectum from above. By waiting five to ten minutes now before operating, the best effect of the quinine is obtained and post-operative anæsthesia is much more satisfactory. The anæsthetizing solution should be slowly forced into the pile, so as to avoid a sudden painful distention of the tissues. After the needle has been inserted, it may be turned in different directions and the tumor well infiltrated. If more than one puncture is made into the hemorrhoid, the solution runs out as rapidly as it is injected. Sufficient fluid should be injected to blanche a part of the hemorrhoid. If several hemorrhoids are to be removed, they are all injected at this time before the removal of any is begun. Quinine solution is used for this part of the infiltration, because it produces anæsthesia which lasts several days during which time healing is well established. The anæsthetizing solution should be used in as limited amount as will obtain the necessary results, because excessive quantities produce a large exudate, which causes a sense of fulness in the rectum for several days.

Technic.—The operative technic is the same under local or general anæsthesia. Having satisfied ourselves that the whole field is thoroughly anæsthetized, the hemorrhoid is picked up at its upper end with a hemorrhoidal forceps, and an incision beginning in the normal mucous membrane one quarter of an inch above the hemorrhoid is carried down on the left side of the pile and beginning again at this upper point a similar incision is carried down on the right side of the tumor. The upper pole of the hemorrhoid is now lifted out of its base, exposing the vessels as they enter the tumor from above. The vessels are now grasped with a thin artery forceps and the tumor cut free. The lateral incisions are now carried down to and around the lower border of the hemorrhoid. These lateral incisions are to be kept close to the hemorrhoid, or preferably in that part of the mucosa covering the side walls of the pile. The dissection is carried down

around and beneath the hemorrhoid to solid connective tissue or fascia about the muscle coat of the bowel and the pile is shelled out by blunt dissection. This enucleation of the tumor is almost a bloodless operation. The pedicle in the grasp of the forceps at the upper end of the wound next receives our attention. The size of this pedicle will vary with the size of the hemorrhoid, but even when the tumor is large and fleshy the pedicle is slender, because it consists only of blood-vessels and the connective tissue supporting structure between them. The pedicle is now lifted well up and examined to make sure that it is thoroughly freed from the mucous membrane, and a No. 0 catgut ligature is slowly but firmly tied close down at the base. One end of the ligature now threaded on a curved non-cutting needle is passed through the base of the stump beneath the ligature. The pedicle is now cut off about one-eighth of an inch above the ligature and the thread that transfixes the stump is tied over the stump and across the encircling ligature, thus preventing it from slipping. As the stump is released it retracts well into the bottom of the wound and the mucous membrane edges fall together over it. It is important to tie the stump carefully, as it is small, and if not properly secured secondary hemorrhage might result. The wound edges fall together in good apposition, but should be secured by two or three small interrupted sutures. If the tumor is in the anal canal, its lower edge may rest at the white line where the skin and mucous membrane meet. If the tumor is of the interno-external variety, it is to be removed *in toto* by continuing the dissection over the white line out onto the skin, taking out a "V"-shaped piece of skin and inflammatory tissue sufficient to restore the anus to a normal appearance, and the wound is closed with a couple of interrupted catgut sutures. When dissecting out the hemorrhoid be sure to leave a clean-cut, smooth-surfaced wound. A ragged wound is more liable to bleed, because it interferes with the normal muscular contraction of the tissues.

There will be a little oozing for the first day or two, but only such as can be cared for by a small external dressing. The lateral incisions are to be kept close to or better upon the edges of the pile to conserve the mucous membrane between the several tumors and not endanger the calibre of the rectum or the anal canal by possible subsequent contraction. Those strips of attached mucous membrane left between each two operative wounds will also assist in rapid and satisfactory

healing. If this work is poorly performed, stricture of the anus may result. Care must be exercised that none of the incisions extend beyond the anæsthetized area. The hemorrhage during the operation is slight. The large vessels are not injured, because they enter the hemorrhoid at its upper part and run parallel with the length of the bowel just under the mucous membrane. If a vessel is accidently severed it is an inferior hemorrhoidal vessel at the lower border and may be picked up and ligated separately or included later in the sutures approximating the wound edges. The operation need not be hurried, as the anæsthesia will last upwards of an hour, and the utmost care and gentleness should be exercised in the use of tissue forceps, retractors and in sponging. It is important that skin tabs be removed at the time of the operation. Otherwise, they engorge and inflame and become most painful.

When the patient is put to bed, keep him in the Sim's position or else prone (on his face). Do not allow him to lie on his back, because in this position the middle and superior hemorrhoidal vessels in their upper portion are in a vertical position. At the pelvic brim they bend a sharp angle, and the abdominal contents are superimposed. All of these obstruct, and as the hemorrhoidal vessels have no valves, there is a back pressure and a tendency to swelling, a giving away of the stitches and more pain as well as a delay in repair. Whether the operation is performed under local or general anæsthesia, be very careful to handle the parts gently, for unnecessary dilatation of the sphincters, as well as rapid or rough manipulations and catching with snap forceps the tissues which are not to be removed, all cause more subsequent pain and increase the danger of infection.

After-Treatment.—The after-treatment of hemorrhoid patients is very exact, but unfortunately is often neglected with the results that complications frequently occur. The degree of pain following any operation for hemorrhoids depends somewhat on the temperament of the patient, but also, and to a large degree, on the technic and skill of the operator. During the first day I use hot compresses and after that a hot Sitz-bath for twenty minutes each day. This cleanses the peri-anal region and relaxes the muscles

No opiate is needed. If the patient has been properly prepared, the bowels will not move until a purgative is given, after which the colon is emptied each day by administering an enema of one ounce of olive oil

in a pint of warm water given through a soft catheter. These patients expect defecation to cause terrible pain, and I presume their fear acts as an inhibition to evacuation. The accumulation of flatus in the bowel is frequently an annoyance. If it occurs, urge the patient to void it. If left to himself, he usually restrains the desire, because he is afraid bleeding may occur, and he will often spend a wakeful, restless night when he could have relieved himself without any possible harm. The patient is advised to use the commode instead of the bed pan, thus contributing to an easier evacuation without straining. When the inclination for a bowel movement is felt, an injection of one ounce of warm mineral oil into the rectum will facilitate defecation without trauma. Wet cotton is used as a detergent after each bowel movement.

I never use bichloride of mercury during the operation nor in any of the after-dressings, because it sets up a teasing tenemus as soon as the sensory nerves recover. Neither do I use a rectal tube; it cannot do any good and it always makes the patient uncomfortable.

The advantages of this technic are:

1. The operation is thorough and is satisfactorily performed under local anæsthesia.

2. The sphincter muscles are not disturbed or injured by forcible dilatation as a speculum is not used.

3. The ligature is so applied as to securely hold the vessels and secondary hemorrhage cannot occur.

4. The stump is small and buried, and the wound edges are closely approximated, so that the resulting scar is smooth and level with the surrounding mucosa instead of being raised. Therefore, it does not obstruct the passages of the fæces. It is this raised hard scar left after operation for the removal of hemorrhoids which more than any other one factor tends to induce a recurrence of the trouble.

5. All of the diseased tissue is removed, therefore recurrence is impossible, but enough of the mucosa is left to maintain in good order the tactile sensibility of the anus.

6. The scar of the wound conforms to the axis of the anal canal and cannot narrow the lumen of the bowel.

7. The post-operative analgesia of the quinine solution continues for several days, and the patient is up and out in a day or two.

Pædiatrics

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MENTAL HYGIENE IN ITS RELATION TO CHILDREN OF SCHOOL AGE*

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Psychiatry, or the understanding of abnormal reactions, stands in very definite relationship to the causes, cure and prevention of mental diseases. It is important, not only because of the serious death toll resulting from such disorders, but also because of the economic inefficiency resulting in the inability of the number of individuals suffering from even mild types to adjust themselves properly to the more or less complex situation in life. Furthermore, such individuals are in frequent conflict with the customs and conventions of society. Reports of crimes and misdemeanors committed by them convey a very definite meaning to those who are familiar with the abnormalities of the conduct of persons suffering from mental diseases. The frequency of such occurrences is a reliable index of the magnitude of one phase of the mental hygiene problem. Recent studies conducted by the Public Health Service of the mental conditions of a large group of American school children and inmates of private and State schools for the reformation of juvenile delinquents have demonstrated that numbers of them are under average in mental development or suffer from some form of psychic disturbance.

Because school constitutes so important a period in the development of a child's personality and because the dominant symptoms of a number of well-recognized types of mental disorders may be considered as perversions of certain traits of character common to all children, teachers, medical inspectors of schools, and others concerned with child hygiene problems, should learn to recognize faulty traits of

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character in devolping children. It must ever be borne in mind that the composite of all the traits of character exhibited by an individual constitutes personality, and this is determined not only by heredity but by the impress of all the extrinsic factors that influence physical and mental growth and development. The recognition of the influence of these factors furnishes the key to the preventive measures which constitute the modern program in mental hygiene. The training given a child during infancy and the pre-school age, his environment, his associations, his fears, his likes and dislikes, the amount of rest and play, and the occurrences of diseases all enter into the development of his personality. Although these influences are probably beyond conscious recall, nevertheless they are reflected by his mental adjustments of later life.

When the child reaches school age, the so-called pre-adolescent stage of development, his character is beginning to manifest itself. It is at this time that the opportunity of all others presents itself for the building of sound character for future men and women, because faulty traits of personality, which may be corrected in their incipiency, if neglected, tend in later life to become crystalized into habit. In order to impart this training, however, those concerned with the welfare of children should become familiar with the significance of certain childish tendencies and their rôle in the development of undesirable traits of character. It may be well, therefore, to describe a number of childish traits that are frequently observed and trace their molding into undesirable habits of thought and actions through failure of those responsible for the child, to properly interpret their significance.

Those concerned with the welfare of children should ever bear in mind that the impulsiveness and ever-changing activity of a number of so-called fidgety children are but symptoms of mental fatigue. Normal children are active and impulsive. This is nature's method of education, and children, therefore, should be allowed to exercise these mental traits. Rigid discipline tends to curb natural activities, which then seek outlets in other more or less roundabout ways. For example, too rigid discipline tends to cause the harboring of resentment against and disregard for those in authority. When once discipline is relaxed, the child, having failed to learn to control his impulses, frequently find himself in difficult and compromising situations.

Disciplinary measures should follow the form of substituting

desirable activities for undesirable ones. To do this effectively, the teacher, besides having an understanding of personality, should be able, by the exercise of tact and judgment, to secure attention and discipline without apparent effort and without the knowledge of the child. This is especially important when the impulsiveness and activity of the child are so marked as to attract attention.

Children normally concentrate on the thing at hand, but under the artificial restraints of school life they may lose the ability and desire to do this, and become unstable in the direction of their activities. The evidence of fatigue must be watched for and prevented by assigning short tasks that should always be carried to completion and these followed by short periods of relaxation. The tasks should be gradually lengthened commensurate with the development of the child and made more difficult; otherwise the changing activities symptomatic of fatigue will become crystallized into an unstable personality, characterized by faulty thought and aimless purpose. In other words, the natural concentration exhibited by the child should be encouraged and his normal activities should be wisely directed toward useful ends.

A child who has already developed a faulty habit in this respect should be trained so as to be less easily distracted and his natural ability to concentrate should be strengthened by directing his energies along productive lines. Failure to do this will allow the habit to become fixed because of the unconscious tendency of such a child to find an outlet for his excessive energy along the path of least resistance. This leads to an inability to adjust himself to the normal routine of life in later years.

The neglect of these simple principles in training tend to induce and encourage traits of personality that are characterized by impulsiveness, and ever-changing and over-activity that is recognized as being slightly abnormal. In those slightly abnormal or unstable individuals the tendency to a frank outcrop of insanity, known as the manic-depressive psychosis, appears in the light of past experiences a plausible result.

During recent studies a number of children have been frequently encountered who at home exhibit a marked attachment for either the father or mother and as a result are seldom subjected to disciplinary measures. In school children of this type often show a like fondness for the teacher or for older children and are made jealous by the atten-

tions of their favorites to other children. In a number of instances, such attachments are but a manifestation of the spirit of selfishness and self-aggrandizement. These children are frequently arrogant and cruel to their playmates and are disliked by them.

Teachers should exercise great care to prevent the development of unusual attachments by children at school and substitute for this tendency a desire for normal conduct in respect to their fellow pupils. They should carefully avoid making pets of them and endeavor to teach them to subordinate their own likes and dislikes in proper degree as relating to other children, and to realize that others are entitled to as much consideration as themselves. In the case of a number of such children, neglect of this precaution will result in abnormal mental reactions in later life which will be sources of much unhappiness, discouragement and difficult adjustment to social and economic requirements.

It is a well-observed fact that the traits of character known collectively as the egotistic personality are encountered among epileptics, and indeed have long been recognized as the epileptic temperament.

It is a well-known fact that children are naturally imaginative. The fancies are many and varied and serve a proper rôle in the intellectual and emotional development. Unfortunately, the fancies may assume an improper trend fraught with serious consequences. This fact is brought out when it is recalled that children, as a rule, do not harbor resentment, but naturally attempt to settle their quarrels by argument. On the other hand, a number of children do harbor resentment when their power of self-assertion has been stunted through following the lines of least resistance in the settlement of childish disputes and discords instead of meeting them frankly and squarely. The children of this type are given to so-called day dreams and reflections over supposed wrongs. They weave fancies about suppositious injuries which give a species of satisfaction and contentment. These fancies, unless properly directed, ultimately become fixed habits of thought which make for poor mental adjustment in after life. For this reason, any system of training of children should take into consideration their imaginative faculties and the tendency to build air castles and weave fancies. When properly controlled, these are healthy substitutes for the whimsical and capricious longings of childhood that may ultimately result in mental maladjustment. For this

reason the real or fancied wrongs of children should be settled without delay, the discomforts and discords should be smoothed to the satisfaction of the child and he should be encouraged to make confession of his feelings and desires.

Although children suffer a natural degree of shyness and a certain timidity during the formation of an acquaintanceship it is usual for them to adjust their relations with other children for themselves. When the natural desire of children for social intercourse is not encouraged or is undeveloped other children will tease and torment them, if allowed to do so, or will have nothing to do with them. If a child is able to assert his rights he is taken into the fold by common consent and becomes a part of the flock. If, however, he is not encouraged to overcome shyness and timidity and to assert himself these faulty traits of character become more and more marked. The child becomes seclusive largely because of the greater opportunity afforded him to weave fancies about his insufferable lot. Later in life the habit of introspection thus formed serves as a mental pitfall.

The wise teacher should note seclusiveness in children and the tendency of other children to leave them to this fate. If the true meaning of this is not understood, and if through sympathy she makes the mistake of encouraging a child by adopting him, as it were, as her protege, the child soon looks upon the teacher as a substitute and clings to her as a protector, and the tendency to indulge in reflections over his supposed wrongs is encouraged. Dependence in this respect will increase with advancing age until it becomes a fixed habit of infantile tendencies.

When the child has reached the period of adolescence, these traits become a personality which has been termed the "shut-in" type. There is no longer any question that the shut-in type of personality serves in the genesis of a chronic mental disorder known as dementia præcox. In the prevention of this type of warped personality, the school regime, including play, should be so adjusted that other children will recognize the needs of these unfortunate ones and encourage them to take their place among them, thereby developing the stunted social traits so that they may eventually exercise a desirable degree of self-assertion.

Those interested in the welfare of children should begin to appreciate the importance of recognizing faulty traits of character that may eventually result in the development of anti-social tendencies in after

years. In the understanding of the development of these traits of character, a knowledge of the child's heredity, environment, and educational opportunities should be had; in addition thereto, one should have an understanding of his grasp of general and school knowledge, his efforts or energy output, and, in fact, an understanding of his whole personality and development, mental history as well as physical. Such knowledge is important from the standpoint of understanding traits of character that make for good adaptation to the more or less complex situations of life.

This article has dealt only with the traits of personality which relate to the individual's energy output, his estimate of himself and his ability to bring himself into harmonious relations with the thought and pursuits of others. These traits are, after all, those of native endowment, which when properly developed make for a well balanced personality.

During the past few years earnest efforts have been expended in the study of these traits of character, efforts which have pointed the way to a better understanding of the development of mental disorders in after life. The continuation of these psychiatric studies and the dissemination of the knowledge already gained will serve a true and genuine purpose in mental hygiene and marks the dawn of a new preventive medicine.

THE PSYCHOLOGY OF THE SICK CHILD AS COMPARED WITH THE HEALTHY CHILD

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The sick child differs from the well child, not only physically, but also psychologically. Of course, not all children react to disease in the same manner, nor do all diseases produce the same mental reaction in a given child, but as a whole, there are certain psychological changes taking place in the sick child that are characteristic of practically all sick children and of most diseases.

In order to understand the sick child, one must naturally know the healthy child. I shall, therefore, discuss first a few points in the psychology of the healthy child.

The child's mental attitude is not stationary; it is constantly moving, constantly progressing. There is the new-born child, who apparently knows nothing more than to crave for food. Before long the same helpless baby begins to coo, to recognize you, to talk, to walk, perfecting himself progressively. Certain mental peculiarities, however, are retained all through infancy and childhood, the following being the most constant:

1. *Activity.*—A normal child, from birth to adolescence, exhibits a more or less constant desire to do something. Normal infants are constantly active when awake. Sometimes they expend energy in playing, by swinging their arms and kicking their feet, thus exercising the muscles of the extremities; sometimes they expend energy by their vocal cords and laryngeal muscles, by crying and talking, and at other times they exercise the muscles of their jaws by eating or making grimaces. At times one wonders how it is possible for an infant, or for a child of three or four to be active from early morning until late at night. The child seems to have double, triple, and perhaps even tenfold the amount of energy of an adult. The amount of energy expended by a child two or three years of age is tremendous in comparison to the body weight and height. I believe that play, which has been considered by most people as one of the fundamental charac-

teristics of infancy and childhood, may be placed as a subheading of work. Play, as indulged in by a child, is simply a form of work in which the different muscles are more or less vigorously exercised.

2. *Imitation.*—If proof is wanted to the theory that man is the outgrowth of an ape, the quality of imitation may supply it. The child learns to do almost everything through imitation. The connection of imitation with the problem of child education is well worth keeping in mind. The only function that the child does not acquire by imitation is that of eating. The craving for food seems to be an inborn instinct in the baby, although it is possible that closer observation may reveal that even some aspects of the act of taking food are acquired by imitation.

3. *Imagination.*—Although we see comparatively few adults who possess a strong imaginative sense, we find that all children or at least all normal children, possess a remarkable power of imagination. It is no mere incident that most children like fairy stories. There is something in a fairy story that fires the imagination of the child, that carries him away to other spheres, that gives his imagination a chance to stretch to worlds not limited by time or space. It is too bad that children cannot express their imagination in writing, and that so few writers know the child mind well enough to picture the flight of childish imagination. Were the child able to give expression to his imagination on paper, we would no doubt have a literature, the like of which has never been seen. The child is able to picture incidents in life that to our cold-blooded minds is impossible. We, who see everything from the standpoint of bread and butter; we, who measure space by yards and miles, and time by minutes and hours, cannot let our imagination wander very far. As soon as we conceive of incidents that seem to be a little out of the way our limited, but at the same time materialistic, experience confronts us and stops us; this we realize is impossible, that is unplausible. The child mind, however, admits no limitations of time nor space. What is to us a day or an hour may seem to the child a thousand years. Imagination plays one of the greatest rôles in the life of the child. He hobnobs indiscriminately with prince and pauper. He takes delight in acting the part of an imaginary hero. Sometimes he is a king, sometimes a mighty general, sometimes a wonderful magician. He revels in the art of everyday make-believe. He will pretend that he is his own father, mother, sister or brother, that he is a dog or bear, a puffing

steam-engine and what not. Nothing is too good or too bad for him; nothing too big or too small. His breadth of imagination covers everything.

4. *Love for Justice.*—For years, nay, for centuries, people who crowned themselves with the titles of philosophers and leaders advocated as "the truth" that men are born bad, and that it is the function of religion and education, and the duty of teachers, priests and political leaders, to direct humanity to the right path. However, if one looks matters squarely in the face, he realizes that the child not only likes justice, but often fearlessly demands justice. One of the reasons why children love fairy tales is because they have a sense of justice, which is the basis of nearly all fairy stories. No matter what happens during the course of a fairy tale, everything turns out right in the end. The bride and groom live happy for ever after. The money stolen from the hero is returned to him in the form of a hidden treasure. The princess, who was killed in the attempt to save her lover, is transformed into a dove and thence into a human being. The wise man who was executed by the king, who disapproved of his advice, returns from heaven riding on a horse. To my mind, search for justice and love of righteousness is a strong characteristic of the normal, healthy child, which remains with him to the time he comes into contact with the superficialities of civilized life.

5. *Happiness.*—Above all, healthy children are happy by nature. The pictures on the wall, the flowers in the garden, the sun, the moon, the stars are all sources of child happiness. Even little spurts of temper expressed in a stamp of the foot, in a dash of the precious toy do not last long. The fit of anger is over in a few minutes or seconds and happiness is again restored. Children will find cause for laughter at the pettiest thing—a grimace, a shrug of the shoulders, not because of the inherent fun in the object, but because the child itself bubbles over with energy and happiness.

THE SICK CHILD

When a child falls ill, no matter how slightly ill he may be, all normal psychological characteristics either disappear or are perverted.

Activity.—Fever uses up the surplus energy of the child, so the sick child does not want to work; indeed, he cannot work if he would, and since he cannot work he also ceases to play, for, as pointed out above, play to the child is another form of work.

Imitation.—A sick child soon loses cognizance of its surroundings. Even adults centre most of their thoughts on themselves when they are sick. In them, however, this characteristic is not so marked as in children. Most children, although they do not want to be left alone when sick, cannot bear to have their parents or nurses do anything in their presence that would call for an expression of imitation. In fact, attempts to please the sick child often bore or even anger it. You cannot teach a sick child. You cannot even attract its attention to anything outside of its sickness.

Imagination and Sense of Justice.—Although two properties, activity and imitation, are notably absent in the sick child, the power of imagination is stronger than usual and is directed along morbid channels in time of illness. The fairies give way to witches, and sunshine to storm. The child imagines he sees robbers approaching, dogs barking, horses tramping, and he feels that all of them together are contriving to do him harm. Of all the stories he has heard during his life, only fragments return during his sickness; the wise man the king has ordered killed does not reappear as an angel or dove to bring happiness to the world. The princess does not return to her lover. In short, imagination becomes hallucination, and justice is turned into injustice.

Happiness.—As for happiness, it is self-understood that the sick child cannot be happy. There is only one disease in which the toxin seems to exert a stimulus to make the afflicted person hopeful. Physicians and nurses who work with tuberculous people claim that tuberculous patients, as a rule, are confident that they are going to get well, and at times are even happy. However, with this one exception, disease exerts a depressing effect on the patient, which is doubly noticeable in the young patient. The child drops his head down on the pillow, and he does not dare raise it, as though he were afraid that something would befall him if he did. At times it may seem as if the patient is resting quietly, but the expression of his face tells a different story. The happiness that lights up the face of the normal child disappears, and an expression of sadness takes its place. It is not merely pain that robs the child of his happiness; it is the sick feeling, the lack of confidence in himself, the lack of healthy imagination and the lack of the prevailing sense of justice that rob the child of his happiness and fill him with gloom.

Can a knowledge of the psychology of the sick child be utilized in

practice? Is it necessary for a physician or a nurse, who deals with sick children, to possess a knowledge of the psychological moods of the healthy and the sick child, and is it possible in turn to make use of this knowledge for the benefit of the child? In my mind there exists no doubt that not only can and should a knowledge of the child's attitude be utilized by the physician and nurse alike, but that without a knowledge of the psychological peculiarities of both the healthy and sick child, it is hardly possible to attend a sick child properly. In dealing with a child one is confronted not only with physical ailments, but also with a complicated nervous mechanism which has not had sufficient time to stabilize itself, which has had no time as yet to tread out paths or to form habits. The child lives not from stored-up energy, but from impressions, from imaginings, and unless one realizes that in treating sick children he is dealing with a moving pathology which has taken the place of a constantly changing physiology, he is helpless in the face of any ailment in the child, be it a pneumonia or a hang-nail. The physician who knows the child from a psychological standpoint as well as a physical, the physician who can win over the child, which usually also means winning the mother and at times the grandmother, is the physician who is usually most successful, his success being more apparent in the actual results he obtains than in the mere medical treatment of the child. Such a physician usually understands the responsibility placed upon his shoulders in treating children.

What is true of the physician is doubly true of the nurse. The nurse is put in charge of a sick child, not only to administer medicine, but also to feed the child, to make him comfortable and to do everything she can to help him on the way to recovery. In order to obtain these results the nurse has to take the place of the mother—a very difficult position to fill, for no matter how good the nurse may be, she will have to go far to be as good as the mother, and no matter how kind she may be, she will have to exert every effort to be as kind as the mother. The child has been given over to the care of the nurse especially because she is not the mother, and can therefore keep a clear head in case of danger, whereas, the mother would be overcome by her emotions. It therefore behooves the nurse to make a study of the child's moods and habits, and the changes of these moods and habits during disease. The nurse must realize that the child who

acts cross and peevish during illness has not always been so. She must realize that the child who now seems too lazy to do anything for himself, and who demands that she do everything for him, at one time worked like a little beaver merely for the sake of working. She should also know that the child to whom no toys are now acceptable at one time spent hour after hour in playing with a jagged stick, a broken doll, a legless chair. The nurse must realize that the child is passing not only through a physical crisis, but also through a mental one, and she should therefore make it her duty to help the little patient pass through the ordeal before him in as quiet and peaceful a manner as possible. To be a nurse for any patient requires a great deal of patience; to be a children's nurse, one must have limitless patience, superhuman endurance and heavenly kindness.

The change in the mental attitude of the sick child is doubly pronounced if the child is at the hospital. In addition to the disease itself, which tortures the little patient, there are several other factors that add to his distress: the change of surroundings, the sight of strange faces, the shock of being away from mother and father. It is hard enough for an adult to change his mode of living in one day; how much harder then is it for a young child to be robbed all at once of his mother, who has been the only person he has known intimately in his life, and be at the mercy of a stranger whom he has never seen before. If the nurse understands the mental attitude of the sick child, she cannot help but act the part of the mother during the child's stay at the hospital. She should make the hospital atmosphere as home-like as possible; she should help the child bridge over the mental crises that confront him; she should employ all means possible to restore to the child the normal psychological functions that characterize him in time of health—activity, imagination, love for justice and happiness.

The psychology of the sick child is a fertile and practical field for study. Investigation along this line will bring to light a great deal in the symptomatology and subsequently in the treatment of the various diseases of childhood; for there is much to indicate that each group of diseases carries with it special psychological phenomena. The study of the psychology of the sick child should make a strong appeal to every physician and nurse who is interested in the welfare of the child.

Obstetrics

AFTER-RESULTS FROM THE EDINBURGH ANTENATAL CLINIC

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In a recent number of the INTERNATIONAL CLINICS * there appeared an article entitled "An Afternoon at the Antenatal Clinic in the Edinburgh Royal Maternity Hospital" from the pen of Dr. J. W. Ballantyne. In the following short paper I shall attempt, with his permission, to give an account of the after-results of some of the cases described by him in that paper, and, in addition, relate briefly the after-histories of one or two other cases who presented themselves at the Antenatal Clinic on subsequent occasions and who showed some features of general interest.

RECTIFICATION OF POSTERIOR POSITION; INDUCTION NEAR TERM FOR LARGE CHILD

The *second case* in Doctor Ballantyne's list was that of a ii para, thirty-one years of age, whose probable date of confinement was December 23rd. At her first visit to the clinic on June 10th last she gave a history of a still-born, full-time child born by the breech, in which the cause of the still birth had been delay with the after-coming head. Her pelvic measurements were 9½ and 10½ inches and C. D. 4¾ inches. Her present pregnancy was progressing normally, except for marked constipation. She subsequently paid seven visits to the clinic at intervals of about a month, her last visit being on November 24th. The constipation continued to trouble her, various remedies being tried without the desired effect, and it was by castor oil, combined with enemas, that regularity was at last obtained. At her second visit, on

* INTERNATIONAL CLINICS, 29th Series, Vol. iii, p. 185, 1919.

July 8th, the fœtal heart was heard in the middle line below the umbilicus, she at that time being a little over four months gone. At subsequent visits in August, September and October the fœtal heart could not be heard, owing to the child lying in a posterior position. At the November visit the child was lying in L.O.P., but by external manipulation this was transformed to L.O.A., and the fœtal heart then became audible in the corresponding position, *viz.*, below and to the left of the umbilicus. At the last visit she paid to the clinic the L.O.A. position was still maintained. She was taken into the Royal Maternity Hospital on December 10th, *i.e.*, twelve days before her estimated date. It was found that there was some overlapping of the head, and that the position was still L.O.A. It was considered that induction was indicated, and this was carried out by separation of the membranes around the internal os by means of a metal bougie. A male child, eight pounds four ounces in weight, was safely born on the 18th and both mother and child were discharged well on the tenth day of the puerperium.

This case illustrates the method of external version in posterior positions—a method of treatment that is being used with great success by Doctor Ballantyne in the Antenatal Clinic at the Edinburgh Royal Maternity Hospital, and also the importance of taking into account the *relative* sizes of the pelvis and the fœtal head, even in cases where there is no pelvic contraction. It has been well said by Barbour, "the fœtal head is the best pelvimeter," and again and again —especially during the last three months, in which there have been born an unusual number of abnormally large babies—the truth of this epigram has been illustrated in the practice of the Royal Maternity Hospital. Almost weekly cases are admitted from the town or district in which the history is somewhat as follows: A multipara with a history of two or three previous normal and easy confinements, and no pelvic contraction goes into labor. She is perhaps seen by her doctor for the first time when he is sent for to assist her after the labor has already lasted for some hours, with little progress. Knowing her previous history of easy labors, he does not expect any trouble, and perhaps finding the head above the brim, or, at most, very slightly engaged, he applies forceps, and after one or more unsuccessful attempts at delivery she is sent in to the Maternity Hospital, and it is then found that the head of the abnormally large or possibly post-

mature child is unable to pass through the mother's normal pelvis. Such cases generally end in craniotomy and form the tragedies of lying-in hospital practice; the child is invariably very large, well nourished and perfectly formed, but the safety of the mother demands the sacrifice of its life. Such would almost certainly have been the case in the particular case under review, had not the mother submitted herself to supervision, and the relative sizes of the pelvis and fœtal head carefully estimated.

Cases 3 and 4.—The third case mentioned in Doctor Ballantyne's paper [1] was that of a i para, aged twenty-nine, whose labor was expected three weeks from her visit, *viz.*, on June 30th. "The fœtus was lying in an anterior position, the head was in the pelvic cavity, the measurements were 8¾ and 10½ and the conjugate roomy." Her only trouble was acidity. This patient was delivered on July 3rd, *viz.*, three days after her expected date. The position of the head in labor was L.O.A., labor was easy and resulted in a female child weighing six pounds nine ounces. The fourth case was a vi para whose probable date of confinement had been estimated as June 1st. She was, therefore, now (June 10th) ten days or so past her date. There was a vaginal discharge and some difficulty in passing water, which contained a trace of albumen. Doctor Ballantyne advised her to come into the hospital in order that douching might be carried out with the double purpose of cleansing the vagina and exciting uterine contractions. This, however, she ultimately declined to do and she was confined in the district on June 25th, the labor being normal.

A CASE OF SYPHILIS

The *sixth case* was due in first week of July.[2] She suffered from condylomata, which had been regarded as enlarged veins and had been entered as such at the first visit, and from slight albuminuria; and she was taken into the hospital for treatment. The blood examination showed a strongly positive Wassermann, but only two intravenous injections of arsphenamin had been administered when labor supervened on July 7th, a female child being born which seemed quite healthy and weighed eight pounds. No physical signs of syphilis had declared themselves at the time of discharge from hospital, *viz.*, ten

[1] *Loc. cit.*, p. 188.
[2] *Loc. cit.*, p. 189.

days after birth. The mother was advised to continue treatment and for that purpose to report herself at the Women's Hospital, Bruntsfield. At the same time the Medical Superintendent of the Edinburgh Infant Welfare Scheme received the usual notification with regard to both mother and child and will keep in touch with both by means of visiting nurses.

SPONTANEOUS RECTIFICATION OF A POSTERIOR POSITION

The *seventh case* was a primipara, aged twenty-four, due September 10th.[3] At her first visit her pelvic measurements were found to be normal, but the fœtal heart could not be heard, owing to the posterior position of the child. This patient subsequently paid four visits to the clinic. At her second visit on July 8th the fœtus was still posterior, but its heart was heard between R.O.A. and R.O.P. On July 25th it (the fœtal heart) was in R.O.P. On August 12th the fœtal heart was again heard and the position was now L.O.A., that is, the fœtus had rotated into the latter position and this was again confirmed by palpation and auscultation on August 22nd. On September 2nd she was delivered in the hospital of a male child, seven pounds in weight, the position of the head in labor being L.O.A. and the labor easy and natural.

CONFIRMATION OF DIAGNOSIS OF SMALL CHILD

The *eighth case* was a ii para, aged thirty, due July 10th.[4] At her first labor she had been delivered of a full-time child which only weighed five pounds at birth. Her interspinous diameter was 10 inches and her intercristal 10¼, and the pelvis, therefore, of the simple flat variety. The question arose as to whether it would be safe to allow her to go to full time. In the meantime, the present child appeared small, the fundus uteri was only one and a half inches above the umbilicus, and the head could be pressed easily into the brim. She was, therefore, kept under observation, with the result that she was allowed to go to exactly her estimated date, *viz.*, July 10th, at which period the head could be pressed into the brim. Labor was then induced by separating the membranes by means of the finger swept around inside the internal os. Labor was thereafter natural, and a

[3] *Loc. cit.*, p. 190.
[4] *Loc. cit.*, p. 190.

full-time child weighing five pounds four ounces, alive and healthy, resulted. Both mother and child left the hospital well.

GONORRHŒA (?) AND EPILEPSY

The *ninth case* was a iv para, aged thirty-nine, with a history of epileptic fits.[5] Her last child had suffered from ophthalmia neonatorum. The mother had suffered from a yellowish vaginal discharge, examination of which revealed numerous Gram positive cocci, but no gonococci or at least no Gram negative intracellular cocci. This patient subsequently paid eight visits to the clinic on the day set apart for venereal cases, and her discharge was there treated by swabbing the vagina with a weak solution of potassium permanganate. At one of her visits her urine was found to contain a trace of albumen, and during the remaining weeks of her pregnancy she continued to have two fits a week, which were, however, of a mild nature. She was delivered of a male child, eight pounds three ounces, after a laborious labor which did not require instrumental assistance. She had several epileptic fits during labor.

PROVISIONAL DIAGNOSIS OF TWINS

Doctor Ballantyne's *tenth case*[6]: This was a Leith patient, aged twenty-three years, and in her first pregnancy. Her probable date had been calculated as August 23rd. She was, therefore, on this date (June 10th) in her seventh month. The urine was normal and a diagnosis of posterior position and vertex presentation was made. At this patient's second visit on July 25th the urine was found to contain albumen and swelling of the ankles was noted. The posterior position was still maintained. The notes of this date state: "Possible twins, two heads felt." She was advised regarding her diet and was told that one of the resident medical officers of the hospital would visit her. The subsequent history is very brief. She came into the hospital on the onset of pains on August 7th and shortly thereafter gave birth to twins, both females, the first presenting by the vertex, and weighing five pounds, the second by the breech, and weighing six pounds. Both babies and the mother did well, and before her discharge from hospital the albuminuria had quite cleared up.

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[5] *Loc. cit.*, p. 191.

[6] *Loc. cit.*, p. 191.

FŒTAL DEATH

Twelfth Case.—She was thirty-six years of age and a iv para.[7] In 1915 she had suffered from eclampsia, and in 1918 from ante partum hemorrhage, apparently accidental. Her probable date of confinement was October 16th. The urine was slightly albuminous, but there were no prëeclamptic symptoms. On July 8th she stated that she had not felt movements for about a week. The uterus was at the level of the umbilicus, and the urine contained a considerable amount of albumen. No fœtal movements could be detected, nor could the fœtal heart be heard. She was admitted at once to hospital and kept under supervision until July 26th when she expelled a macerated fœtus, the placenta requiring manual removal.

HYDRAMNIOS AND TWINS

Fifteenth Case.[8]—A primapara, aged thirty-three, who had first visited the clinic on May 16th. Her expected date was August 22nd. She suffered from varicose veins and acidity. The fœtal heart could not be heard on account of the posterior position of the child. At her first return visit on June 10th some hydramnios was noticed and again no fœtal heart was heard. She returned on July 8th, when slight albuminuria was found, and hydramnios had increased to such an extent that it was considered advisable to take her into the hospital, and this was accordingly done. On July 26th she was delivered of twins, the first being born as L.O.A., and the second as a breech. Both were girls, and they weighed five pounds and six pounds two ounces, respectively. The placenta was adherent and required manual removal, and in addition there was a considerable amount of post partum hemorrhage. The mother's recovery, however, was uneventful, and with her babies she left the hospital well. In this case the hydramnios masked the presence of twins, which were not suspected.

The above cases have been considered in some detail, partly because they are cases referred to in Doctor Ballantyne's paper, partly because they are a fair representation of the kind of case with its after-results seen at an everyday antenatal clinic.

[7] *Loc. cit.*, p. 192.
[8] *Loc. cit.*, p. 193.

PELVIC PRESENTATION IN AN ELDERLY PRIMIPARA; VERSION UNSUCCESSFUL; CÆSAREAN SECTION

I shall now refer to the after-histories of one or two cases that present features of special interest. Such a case was that of Mrs. D., who was first seen at the Antenatal Clinic on March 4, 1919. She was forty-one years of age, had been married one year and was expecting her first baby on May 16th. She suffered from marked constipation and frequency of micturition, but the urine contained nothing abnormal. Her pelvic measurements were 9½ and 10½ inches, and the promontory could not be felt on examination per vagina, but the pelvis though normal was not roomy. A pelvic presentation was diagnosed and Doctor Ballantyne's attempt to convert it into a cephalic by external manipulation failed for the time being. She was ordered an aperient and asked to return again in a month. At the second visit she was retained in the hospital with a view to performance of prophylactic version. Combined external and internal manipulation were tried (Dr. Haig Ferguson) on two occasions under chloroform, but owing partly to the fact that the breech was tightly wedged in the pelvic brim and partly to scarcity of liquor amnii both attempts completely failed. The physician was then faced with the problem: should this woman at the age of forty-one, with firm, unyielding tissues in her first, and probably her last, pregnancy, be allowed to go into labor and bear the child by the natural passages. If so, the chances of a living child would be very small and the risk of severe laceration of the mother considerable, owing to the probable necessity of rapid delivery of the after-coming head in efforts to save the child. The risks to the child and the mother were carefully explained to the prospective mother and her husband, and the alternative of Cæsarean section with its much enhanced chance for the child, and scarcely greater risk for the mother, offered. Both unhesitatingly accepted the latter alternative, and on May 6th section was performed by Dr. Haig Ferguson, and a healthy female child, six and one-half pounds in weight, was safely delivered. Both mother and child did well and were discharged from the hospital at the end of the third week of the puerperium.

FŒTAL PNEUMONIA AND PLEURISY

Of unusual interest is the case of Mrs. C., who was first seen at the clinic on October 3, 1919. She was twenty-nine years of age and was pregnant for the fourth time. She stated that she had been unwell regularly till June, but had felt life in July. Her probable date of confinement was therefore put down as November. Her past history was interesting and important in that her first two children had been dead born at full time (craniotomy), while the third had been born in the Royal Maternity Hospital two years before, the labor having been induced and the child being now alive and well. Her measurements were 23 and 25 cm.,[9] and the promontory could be felt with considerable ease, the C.V. being 8¾ cm. The pelvis was therefore of the simple flat variety. The child was lying in R.O.A. position and the head could still be pressed into the pelvic brim. In view of her past history and the pelvic contraction, she was kept under observation until in the first week of December the relative sizes of the head and pelvis were such that it was decided to induce labor. This was done by packing the lower uterine segment with sterile iodoform gauze, which was removed after being in for twelve hours. Vaginal douching was employed thereafter for three days, at the end of which time labor pains started and non-instrumental delivery was soon expected. It should be mentioned that during the time she was being kept under observation it was decided that the date first calculated was probably wrong, and that the correct date estimated from the size of the uterus and child was more likely mid-December. The labor was fairly easy, the first stage lasting twelve hours, the second two hours and the third twenty minutes. Immediately the child was born its respiration was noticed by the sister to be "wheezy" and rapid and almost entirely abdominal in type. Its weight was six and one-half pounds, and it seemed to be about full time and was well nourished. As the breathing continued unsatisfactory, rapid and shallow, and the skin somewhat cyanosed, the child was kept in an incubator, but died on the third day without developing any further symptoms.

A post-mortem examination was performed within a few hours of death. The brain was normal except for a good deal of congestion

[9] The measurements at the clinic are now taken always in the metric system.

of the vessels of the pia. On opening the chest there at once welled up yellowish brown pus which filled the right pleural cavity and was present also in the left but to a smaller extent. The right lung was quite solidified and in a condition of gray hepatization; pus could be freely squeezed out of its cut surface. The free surface of the lung was almost entirely covered, especially in its lower part, by flakes of lymph. The left lung appeared normal, except at its lower part where there were what appeared to be four or five small abscesses projecting on the surface close to the lower margin, each being about 2 mm. in diameter.

In the heart the tricuspid and mitral valves were the seat of ulcerative endocarditis, the valves being much puckered and deformed with masses of partly organized blood clot adherent to them. The aortic and pulmonary valves were perfectly normal.

I shall not enter into any further particulars about this case, as it is intended to publish separately complete clinical and pathological details, but it may be mentioned that cultures taken from the pus in the chest, from the lung, liver and umbilical vein revealed the colon bacillus as the causal organism. The infection had evidently been a uterine one, due possibly to the vaginal douching that had been carried out before the onset of labor. The mother's puerperium was perfectly normal, and was undisturbed by even the slightest abnormal rise of temperature.

THE V. D. ANTENATAL CLINIC

Some account of the after-results of cases treated at the clinic for expectant mothers suffering from venereal disease may be of interest. This is held on Monday only, and is attended by a fair and increasing number of both syphilitic and gonorrhœal cases. With regard to the latter the results of treatment have, so far, been uniformly satisfactory, and in no case has an infection of the child's eyes or an ascending infection of the mother occurred at or after confinement. The milder cases are treated as out-door patients and visit the clinic weekly for treatment, the more severe cases, and especially those in which a definite bacteriological diagnosis of gonorrhœa is made, are taken into the venereal ward for more frequent and vigorous treatment.

SYPHILIS AND A MISSED ABORTION

In the case of the patient suffering from syphilis the results of treatment, if the child is alone taken into account, can scarcely be termed satisfactory. This is partly due to the fact that cases do not come under treatment early enough in the pregnancy. As a rule, only two or three months remain for antenatal treatment, and not infrequently death of the embryo has already occurred, and the patient comes complaining of discharge or bleeding, the result of a missed abortion. Such a case as the latter was that of Mrs. M., aged twenty-six, who first came to the clinic on September 26, 1919. She was already the mother of a healthy child born by the breech seven years before. She was now in her second pregnancy and her expected date of confinement was about the middle of December though, as her periods had been irregular for some time before pregnancy commenced, the exact date was uncertain. In July last she suffered from sore throat and rash, and in August was sent by her doctor to the Royal Infirmary where her husband had already been for some time under treatment and had received eight injections of novarsenobillon. At her visit to the antenatal clinic on September 26th she had already had eight injections of novarsenobillon and was complaining of a brown discharge, but there were no external signs of syphilis, such as rash or condylomata, but she stated that she had never felt life. The uterus was the size of a four months' pregnancy, and she was advised to rest, and a sedative mixture was prescribed. She paid her second visit on October 6th, that is, about a fortnight after the first. Her discharge still continued. The uterus was now the size of a three months' pregnancy. A missed abortion was diagnosed, and she was kept under observation in the V.D. ward for a few days. During that time the discharge continued, and a blood examination revealed a still strongly positive Wassermann, but as no other symptoms, such as bleeding or temperature, developed she was allowed to return home and advised to resume her attendance at the Royal Infirmary in order that the treatment might be continued. On November 17th she returned again to the clinic. In the interval she had had one injection of N.A.B. which, after a week, had been followed by jaundice and from this she still suffered. The urine was normal. The uterus was now the size of a two months' pregnancy. The os was slightly open

and the discharge continued. A mixture containing ergot and nux vomica was prescribed, and she was advised to discontinue her injections meanwhile. On December 1st she again visited the clinic. There was still some jaundice and brown discharge and she reported that there had been a three days' "period." Finally, on December 15th, she expelled the uterine contents in her own home. She was brought into the hospital and remained there during the puerperium, being discharged on the tenth day with the injunction to attend at the Royal Infirmary with her husband until both are satisfactorily cured. It is hoped that as a result the next pregnancy will be productive of a healthy child.

The fœtus expelled was very macerated and measured three inches from vertex to nates. Weight, 40 gms. All the organs were of a pasty consistence and uniformly grayish-brown in color. The placenta weighed 70 gms.; the membranes were macerated and of a dirty brown color; the maternal surface was fibrous in appearance, almost like cartilage. This extended to a depth of a quarter of an inch from the surface, and in the microscopic section was seen to be due to degenerative and retrogressive changes in the decidua. Under the amnion there were numerous blood clots of moderate size, raising the amnion in a tuberose manner from the placenta proper. Microscopically the chief feature, in addition to the decidual changes above referred to, was the fibrous appearance of the villi, which, however, were little, if at all, enlarged. Probably as a consequence of this fibrosis the capillary vessels of the villi were almost entirely absent, and the arterioles had their walls considerably thickened—very much more so than normal, and in a large proportion of cases the lumen was completely obliterated. The contrast with the appearance of the normal placenta is in these cases very striking. These vascular changes were undoubtedly the cause of the fœtal death, and it will therefore be readily understood how early in the pregnancy effective treatment must be commenced in order that they may be prevented. No spirochætæ were found either in the fœtus or placenta.

SYPHILIS AND A MACERATED FŒTUS

Different in many respects was the case of Mrs. K., aged twenty-five, who first visited the clinic on September 16th last. Although,

with the exception of some deafness, she seemed to be perfectly healthy, her history at once aroused suspicion. It was, briefly, as follows: She was in her fifth pregnancy. Her first child was dead born six years ago, at full time. The second was also dead born, at the seventh month; the third was a miscarriage at four and a half months, and the fourth, a macerated fœtus, was born in the Royal Maternity Hospital, Edinburgh, in 1917. Her last menstrual period was May 10th, so that at the date of her first visit she was in her fifth month. She stated that she had felt life about the fourth month. On account of her suspicious history, a Wassermann was done and proved "doubtfully positive"; and in view of this five intravenous injections of novarsenobillon were administered at intervals of ten days. After the fifth injection she did not return for a month, and on December 18th she was brought into the hospital in labor and a macerated fœtus was expelled. It weighed 490 gms. All the organs were of pasty consistence and grayish-brown in color. The liver, lungs, suprarenals, spleen, thymus and brain were examined for spirochætæ, but none were found. The epiphyseal cartilages were normal, except for the usual brown discoloration of maceration.

The placenta weighed 320 gms. and was of fairly healthy appearance. The fibrous appearance of the placenta on its maternal surface the subamniotic blood clots raising it in a tuberose manner from the placenta, were all present exactly as described in the last-mentioned case. In the remaining parts of the cut surface the placental tissue had the normal spongy appearance, but the thickened vessels stood out distinctly and frequently projected like white cords from the otherwise spongy surface. The membranes and cord were somewhat brown and macerated but not markedly so.

Sections of the placenta showed the same appearance microscopically as were described in the previous case and again the vascular changes were probably the primary cause of the fœtal death. The puerperium was uneventful, and she was discharged on December 26th with instructions to present herself for continued supervision and treatment at the Royal Infirmary, or the Bruntsfield Hospital for Women, and at the same time the importance of treatment of the husband was emphasized. It is not unreasonable to hope that her next pregnancy will be productive of a living, healthy child.

CONCLUSIONS

It is obvious from the case records which have been narrated that the antenatal clinic is of value not only to the expectant mothers and their unborn infants from the therapeutic standpoint but also in a remarkable degree to the obstetric specialist from an educational aspect. To him and to the medical students attached to the clinic the opportunities of becoming expert in antenatal diagnosis are very many. Further, a diagnosis then made is subject to the revisal and correction which the subsequent labor affords. What the post-mortem examination is to the physician (in clearing up or confirming his diagnosis), the confinement in a happier way is to the obstetrician in charge of the antenatal clinic. There are, of course, many other advantages to be derived from the antenatal clinic, but the two just referred to are outstanding.

Neurology

NERVOUS EXHAUSTION

A LECTURE DELIVERED IN THE MEDICO-SOCIOLOGICAL COURSE OF THE DEPARTMENT OF SOCIOLOGY OF FORDHAM UNIVERSITY

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THE war has furnished an unexampled opportunity for the study of exhaustion as a cause of nervous and mental diseases or, if there is perhaps a shade of difference in the meaning of the words, of neurotic and psychic diseases, and especially of those that come under the rubric of the psychoneuroses. Just before the war, while the world was getting along quietly and peacefully and when it looked to most people quite impossible that modern civilization could ever again be dragged into a great war because there were too many elements opposed to it, the idea of exhaustion as a prolific source of nervous and mental symptoms was growing more and more in importance. Men and women in the midst of our cult of convenience and comfort were finding it more and more difficult to understand how the people of the older times could possibly have stood a long war with all its attendant trials of mind and body. We were getting to be almost unable to comprehend how our pioneer ancestors stood so much without collapsing under the strain. It seemed quite impossible that our generation, particularly those accustomed to dwelling in the midst of the comforts and even luxuries of our cities could ever stand the hardships of war as history told us their ancestors had done. Indeed, that seemed one of the strongest reasons why we could not possibly have a long war. We might have a brief, decisive conflict between two or more great nations or perhaps between two groups of nations, but a long protracted war was out of the question.

As has been very well said, if you asked a physician before the war, What will happen if we ask some millions of the young men

accustomed to the comforts and conveniences, many of them inured to what would be called the luxuries of life a generation ago, to live in open ditches in the open fields?—the answer would almost surely have been, "They will break down under it." Above all, if it were insisted that the young men would be expected to live out in the open, winter and summer, spring and fall, without any regard to the inclemencies of the weather, there would be no hesitancy at all in the reply that the young men of our generation simply could not stand it. "Have wet feet for days, sleep standing up, crawl into damp beds for whatever sleep lying down they might be able to steal, get their meals irregularly, be glad to get them cold, provided only there was something or other to get, and stand all this while shells were bursting around them and companions were being killed near them and so sadly mutilated that the blood and bits of the tissue of their friends were scattered over them. No! Our young men could not be expected to stand all that." A ruder, earlier generation stood it, but we had changed human nature, or rather human nature in the course of evolution had changed itself, and now men would break down inevitably if such excessive demands as these were made upon their forbearance.

Why, we were accustomed to see young fellows, by whose side a companion had been killed by lightning, so nervous for weeks or months afterwards that they were incapable of doing anything that required accurate and careful attention, and continued interest in serious matters was quite impossible for them. We had seen young women who had gone through railroad accidents and had seen people injured and were not surprised when for years afterwards they were so disturbed in nerves and mind that even the slightest unusual incident disturbed them so that they would not sleep for nights and were quite unable to accomplish the routine work that they had been at before. We were sure that we knew our generation and that our generation could not stand the hardships of war, but would inevitably break down under them.

Picked men, it is true, might stand war conditions for a while, but the period would have to be brief and that was why we were so sure that the war could not last long. Almost any physician, if asked, would have said that if our young men were required to live outside during all the year that one-half of them would come down with tuberculosis before the end of the first winter and one-half of the

remainder would be down with nervous prostration before the end of the first year.

Of course, this is not what happened, but, on the contrary, our young men were in better health than ever before—I mean, of course, the young men of the world generally—not only after a single year of war, but even after more than four years of war. They had often had wet feet for many days following each other. They had often slept in damp beds and were glad to get them in preference to having to lie on the damp ground or the frozen earth. When it rained on them their wet clothes made no difference, though they were often not able to change them for from three days to a week. When it snowed on them and melted because they were vigorously exercising and then their clothes froze on them when they came to rest again, it was just all in the day's work and they not only stood it without breaking down, but they actually thrived under it. That is the military answer to our ideas with regard to exhaustion, and it is an extremely surprising lesson which must not be lost.

The men who held the front line at Verdun in the midst of the severe winter of the Vosges Mountains when the Germans were intent on pushing through had to hold their posts for eight days, it is said. They could not be relieved. The opportunity to send rations to them and, above all, to send anything warm had been extremely limited. They were constantly being attacked by fresh troops sent in against them. Night and day it was all the same, unless perhaps the night was a little the worse because the Germans preferred it, since it added another element of frightfulness to their attacks. It is almost impossible to understand how men stood up under the strain. The French first-line troops did, however, and when at last on the eighth day they could come out they were so tired that they could scarcely drag one foot after another. Just as soon as they were over a little rise in the ground, a few hundred feet back from the front trench they sank down utterly exhausted, no longer able to support themselves, and, though there was snow on the ground, they slept. It seemed no use trying to move them to more comfortable quarters. Directions were given to wrap them in blankets where they lay on the ground, and this was done. Most of them slept for nearly twenty hours almost without a break. They were aroused for warm drinks at intervals.

It is said that not one of these men developed pneumonia. It would seem to the ordinary physician that with this intense exhaustion of vital and nervous forces at least some of these men must have been harborers of the pneumonia specific microbe and with their greatly reduced resistive vitality would surely develop that disease. They did not, however. Possibly the very intensity of the conditions under which they had had to live for eight days had so reduced the virulence and the vitality of the pneumonia microbe that it was not nearly so dangerous as it would have been under other circumstances. Its favorite time is the spring and fall, not winter. Certainly one might very well expect that if ever there was an unfavorable culture medium for the growth of the pneumonia bacterium it would be the mouths of men in the front trenches at Verdun holding out against the Germans in spite of lack of sleep, lack of food, lack of rest, lack of everything that would seem to make possible their thoroughgoing power of endurance.

Such men might possibly be expected later on to afford abundant evidence of the effect of exhaustion and to break down nervously and mentally or both. There is no record, however, of any series of events that would justify any such opinion. Undoubtedly the heroes of Verdun will live as long as the average, and, according to the experience garnered in the war generally, will have no more instances of nervous and mental breakdown among them than would have been the case if they had not gone through such awful conditions. Nature has wonderful reparative power and a compensatory store of energies, but above all she has brakes which prevent particular functions from running off the track or overdoing themselves in such a way that they will not be useful afterwards. An inheritance of defect of any kind is far worse than any crisis through which nature can pass, and it seems probable that even when the crisis apparently is the immediate cause of the breakdown this occurs only on the background of an unfortunate heredity.

We have rather strong traditions to the contrary of this, traditions which seem to indicate that exhaustion can of itself be a direct and active cause of mental and nervous disease, but they are founded on that fruitful source of errors in human history, the impression that a thing *must* be so. Whenever anything scientific "must" be so we use the expression, it must not be forgotten, because we cannot

prove that it *is* so. We have been persuaded that exhaustion *must* bring about these nervous and mental affections, and now the war has come and tried out the experiment in terms of humanity, and we have the chance to make up our minds on very definite evidence as to what actually happens under circumstances that would seem surely to prove exhausting of human energies, mental and physical.

MENTAL EXHAUSTION—EXHAUSTION PSYCHOSIS

One form of mental disease supposed to be due to the effect of exhaustion, that is, of an intense strain with anxiety, lack of nutrition and overwork continued over a long period, is often spoken of as an exhaustion psychosis. It seems to occur particularly in people who are loaded down with anxieties, who take their worries very hard and who, as a consequence, lose appetite and sleep or at least fail to eat properly and have only disturbed sleep. The war presented unfortunately ideal conditions for the development of this mental affection, and it might be expected that a great many cases would be seen, especially among the civil populations of overrun districts where women and growing young folks between twelve and eighteen were subjected to strains and stress such as would seem quite capable of upsetting even normal minds. It would not be a source of surprise then if there had been opportunity for the study of a great many patients suffering from this affection.

The conclusion that has been reached, however, from the study of such cases as occurred, and they were by no means so frequent as could well have been anticipated, is that the mental disturbance called exhaustion psychosis almost never occurs as the result of mere exhaustion, no matter how great that may be, unless the patient is predisposed to mental disease by heredity or by some physical state that was recognized clearly before he or she was subjected to the exhausting condition. As Colonel Mott, senior neurologist to the Maudsley Neurological Clearing Hospital, who saw a great many of the mental cases that occurred in connection with the English army and who was closely in touch with the literature of the subject, declared, "A careful inquiry into the family history and upbringing of these cases will usually show a predisposing constitutional condition."

The exhaustion psychosis is usually said to be a form of confusional insanity or hallucinatory mental confusion, or in the expres-

sive French term which introduces the idea of the dream state so often associated with it, *oniric delirium,* and this was seen rather frequently in connection with war's strains and stresses, but almost never without a preceding inheritance or predisposition of some kind. As Colonel Mott said: "As regards exhaustion being a cause of this psychosis, there is a considerable difference of opinion; undoubtedly exhaustion psychosis is a comforting term to use when we do not know what the mental condition exactly is, nor what the outlook is. The patient may have had a fever, such as typhoid, malaria, influenza or pneumonia, etc., which in some instances has been preceded or followed by prolonged stress of war. A mental disorder, characterized by confusion, follows, and it is assumed that it is due to an exhaustion process affecting the brain, but the facts about to be related rather indicate that a constitutional predisposing cause is at the root of most cases diagnosed as exhaustion psychosis."

Bonhoeffer, who had the opportunity to study conditions in Serbia, where probably the civil population suffered more than anywhere else in the warring countries, for their country was fought over a number of times, and Serbian soldiers were undoubtedly subjected to more hardships and not only to the dangers of war, but of those severe alarming and often panic-making infectious diseases, cholera, typhus, and the like, does not hesitate to say that lack of food pushed to the last degree, subjection to danger until escape with life seems almost impossible, lack of sleep night after night, so that rest has to be fairly stolen under the most uncomfortable circumstances, and with these excessive fatigue, pushed beyond what would seem to be the limit of human endurance, do not of themselves lead to the development of psychosis. Men's minds will not give way even under these awful circumstances, unless they are predisposed by some constitutional defect. Even in women and in growing young folks ten to twenty years of age, subjection to these unspeakable conditions will not have the mental effect which we were so accustomed to think must happen under circumstances like these when a prolonged war makes demands upon human nature that seem almost impossible even for the strongest to stand without giving way under them.

Bonhoeffer states categorically from his experience, as cited by Colonel Mott in his volume, "War Neuroses and Shell Shock" (Oxford Medical Publications, London, 1919):

"For amongst 10,000 Serbs who were taken prisoners of war after suffering the most severe exhaustion, hunger, and loss of sleep, and after being subjected to all manner of infectious illnesses, leading to cardiac weakness with œdema, gross wasting, great loss of strength and a high mortality from tuberculosis and other infectious diseases, only five cases of psychosis developed, a number not higher than would have been expected in peace times amongst a similar number of civilians."

In a word, just the number of cases of mental disease that might have been expected in life under ordinary circumstances occurred among these Serbians when subjected to these awful conditions. It would seem that human nature could not possibly stand what these Serbians had to suffer without giving way, but unless some infection came along to sap their physical vitality or some hereditary influence was present to undermine their mentality, bodies and minds went through the crisis without breaking down. That one observation made on so many people is a magnificent lesson as regards human endurance and the powers of men. They can stand and withstand ever so much more than we have been inclined to think.

Good authorities, then, like Mott himself and Bonhoeffer agree with Aschaffenburg that "exhaustion and overwork must be relegated to the background when considering the psycho-pathogenetic causes of mental diseases." The toxins of infectious diseases are probably much more important than exhaustion as a background for the development of so-called exhaustion psychosis. This is, of course, true also of the toxic effects of alcohol. Excess of alcohol predisposes a man to confusional insanity in some form or other, though the acute mental breakdown may not, as is well known, come until after an accident has happened, the breaking of a leg or an arm with the pain consequent on this and the shock incident to it.

MOBILIZATION PSYCHOSES

Even intense emotion does not play so important a rôle as the predisposition. A very careful study was made in this respect with regard to the effect of mobilization in producing mental disturbance. It is easy to understand that the sudden call upon millions of men which was made at the time of the mobilization of the European armies in early August in 1914 represented an intense emotional shock. Most

men were utterly unprepared for it; they had barely time to say hurried good-byes and obey the order of mobilization; they had no opportunity to arrange their affairs or secure someone else to carry on their business; they simply had to leave wife and family, hoping that somehow these would get along. Many a man must have known that his business was in very tottering shape, for Europe had been suffering from financial depression for several years, while the nations gathered in money into their treasuries to enable them to carry on the war which at least the higher officials anticipated. Not a few men must have realized that it would be quite impossible for their business to weather the stress in the commercial world that would be brought about by the war, and yet there was nothing for them to do but to leave their wives to care for their affairs as best they could and let it go at that. They could scarcely even hope for the best, and while in Germany there may have been the feeling that the war would be brief and decisive and, of course, triumphant, all the French at least knew that their one hope was in a protracted war and that that would be a matter of years, not months, so that they almost knew the worst.

Under these circumstances it would not be surprising if many men broke down mentally under the intensely severe strain to which they were subjected. If mere depth of emotion could overturn reason, surely this state of affairs ought to have accomplished that unfortunate effect in a great many cases. The most careful study has shown, however, that what were known as the mobilization psychoses all occurred either in patients in whom there was a distinct history of insane heredity, usually in those who had previously suffered with mental disease, or else from other psycho-pathic reactions which indicated very clearly that they were of somewhat unbalanced mentality.

Among the civil populations in the terrible sufferings which occurred in Poland, which was fought over by hostile contending armies some six or seven times, no striking increase in the occurrence of mental disease in the population was noted. It might have been expected that this would drive many women, and especially those who had children to care for, crazy, but it did not produce this effect, except in those who were predisposed by inheritance to insanity already. What was true in Poland, as well as in Serbia, as we have

noted, was true also in Galicia and East Prussia, which twice were invaded by Russian armies. There was an intense dread of the Russians fostered among these populations, and yet no great increase of mental disease occurred when the Russian invasion took place. The civil population of Belgium and of northern France, whose home territories were occupied by the German army under the supremely trying conditions which we all know now, did not break down mentally under their afflictions, except in so far as those predisposed to insanity had their regular development of mental affection anticipated somewhat in certain cases because of their hardships.

SUPPOSED DELAYED EFFECTS OF EXHAUSTION

It could very well be thought that the exhaustion processes in these cases of severe and continued strain might be delayed until after the critical emergency and that men would be able to call on their reserve forces so long as they felt they had to, but would break down under it afterwards. It is often presumed that men can draw drafts on their reserve powers of endurance, but that sooner or later they will have to pay these and if they are at all large at a ruinous rate of interest. The nervous breakdowns might possibly, then, be expected to be delayed until peace times, but then would be all the more severe because of the great calls that had been made on the reserve forces. Above all, life and its usefulness would be greatly lessened, the number of years of life diminished so that longevity would be quite out of the question and a hale and hearty, vigorous old age would be almost an impossibility. This sense of exhaustion exists in the minds of many people with regard to hard, protracted effort and has been so emphasized in recent years, when the idea of overwork as one of the prime factors in the production of disease has become so common, that it is very hard to make people understand that there is absolutely no justification for it in the realities of things.

Men who go through the severest military experiences, in which their staying powers are tried to the limit of endurance and even what might seem beyond that, could very well be expected to be sufferers from nervous breakdown in subsequent years and to be short lived as a consequence of the extreme calls which they have so often been compelled to make upon their reserve energies. The recent death of Sir Evelyn Wood, a hero of the Crimean War, is a very striking

illustration, however, of the fact that veteran soldiers who have gone through the severest experiences and the hardest kind of trials not infrequently live long beyond the average of life. He was well on in his eighty-second year when he died and had been in active service under the hardest kind of conditions all his life. He was wounded in the Crimean War at the assault on the Redan in 1855, that is nearly sixty-five years ago. He served through the Indian Mutiny and received the Victoria Cross for heroism of the highest order. He had a few years of home duty, then served through the Ashanti War, the Kaffir War, and in 1879 was in command of the left column of the army which finally settled the Zulu War. He commanded a brigade in the Egyptian Expedition and spent six years there, nearly always in active service of the hardest kind. He was not retired from the army until he became Field Marshal in 1903, when sixty-five years of age. He returned to the active list as Brevet Colonel of the Royal Horse Guards when nearly seventy, but on his subsequent retirement continued to be active as chairman of the Association of The City of London in organizing a territorial force, and he has been of great assistance to the government during the recent war.

Quite needless to say, Field Marshal Wood, instead of being an exception, is only an example of many military men who have had careers of similar length and hardships. Field Marshal Lord Roberts was well past eighty when he died from pneumonia behind the lines in France, not long after the beginning of the war. He, too, had the Victoria Cross for bravery; he had been shot to pieces on one occasion; had been wounded a number of times, and yet was considered a pillar of the English army at the time of his death, and his loss was looked upon as a calamity. Kitchener of Khartoom was approaching seventy when his untimely taking off seemed such an almost irreparable loss. He too had served in India in some extremely severe conditions and in a climate that is hard on the white race, but his great service had been in Africa under a burden of responsibility that might very well have been expected to break him down, and yet at nearly seventy England turned to him as to the one man that could be of the greatest service in the organization of the army for its supreme task.

This war has been full of incidents of this kind, and it has illustrated many other contradictions of current thought with regard to

the idea of exhaustion. It is often said, for instance, that if a man has lived a quiet, regular life for all the years until well beyond middle life, it is an extremely serious thing for him to be subjected to the severe stress and strains of irregular existence, especially under heavy responsibility. Men are supposed almost inevitably to break down under these circumstances. The Generalissimo of the Allied armies, however, the present Field Marshal Foch, was never under fire, actually never in a battle, until this war began. He was nearly sixty-four years of age, and he had lived all his life the absolutely regular existence of a soldier. Almost needless to say, the manœuvres through which he went meant almost nothing compared to the intense hardships of a campaign such as he had to face in the fall of 1914. Over and over again for the next four years Foch was asked to hold almost forelorn hopes against overwhelming numbers. He became famous for his power of holding men under conditions where further resistance seemed almost impossible. He never seemed to know when he was beaten, and he could inspire his men with similar ignorance. His definition of a battle is that "It is a contest of human wills and that an army is never defeated until it admits it, and if it refuses to confess defeat, it is victorious in the end."

After these four years of stress and strain with immense responsibilities, Foch, at the age of nearly sixty-eight, was made the commander-in-chief of the Allied armies and we all know with what happy results. No one was ever a more vital storehouse of energy than he. This war, indeed, has brought out the old men, that is, the men above sixty-five, and has revealed their powers. Clemenceau was nearly eighty years of age when he became the Premier who was needed to gather together all the forces of France and enable her to use them to best advantage against the foe. He had had a stormy career, was supposed to have been put definitely on the shelf after the severe political struggles of a lifetime, and at the end of the war was one of the leading figures of the world, not ready to give up till the job was completed. Manifestly severe stresses and strains under heavy burdens of responsibility, instead of breaking men down, actually seem to arouse in them such sources of vitality that they are capable of doing work long after the time when other men feel that they must give up.

MUTUAL SUGGESTION

If exhaustion of nerve forces were the origin of neuroses in normal men, we ought to have had lots of it as the result of the war's experiences, but we did not. Had these men been subjected to anything like the same conditions in civil life we would be quite sure that a great many of them would break down, but, of course, there was one element in war conditions very different from those of civil life. A great many young men had to stand the same things together; indeed, they felt that all those who were in any sort of health of about their own age had to submit to them and stand them as best they might. Seeing others engaged at them they looked upon them as a matter of course and there was no self-pity to disturb them and no unfortunate sympathy to lessen their powers. They made up their minds that they had to stand them and do the best they could; there was no other alternative, and so forgetting about possible results they just went on and all was well with them. If they had been constantly occupied with the thought that they were surely exhausting their forces and must suffer for that fact sometime before long, it would have been much harder for them to keep up, and this feeling would have put a brake on their energies and made their tasks all the harder for them.

The lesson of the war would seem to be, so far as exhaustion is concerned, that in people who are without any underlying organic disease there are a series of checks and compensations in nature which make it impossible for tiredness, no matter how far it may go to proceed to the extent of exhaustion. The young men, particularly from our cities, indeed from the cities all over the world—and it must not be forgotten that the city men, the despised clerks and bookkeepers and counter-jumpers, held up under the strain of war, at least so far as England and America are concerned, a little better, on the average, than the men from the country, would surely have suffered from exhaustion in the calls made on them, had that been possible. They were utterly unused to such physical strains; it must often have seemed almost literally true that they were tired to death, and yet their powers of recuperation proved thoroughly capable of renewing their strength and giving them a fresh start, as a rule, for even harder work than they had gone through before.

When exhaustion seems to occur, then, there are probably one of two or three other conditions at work besides the overfatigue which is

so often supposed to be the active factor in these cases. Just before and after middle age an exhaustion neurosis, so-called, is almost sure to have for its basis some organic condition that is undiscovered because of lack of careful investigation. Kidneys, heart, lungs, may be affected; there may be latent diabetes, but there is almost surely something of an organic nature and not merely the functional neurosis that is said to be present. Many of these cases represent the beginning of high blood-pressure and but very few, if any, of them are the auto-intoxication which is so popular as a diagnosis with those who do not take the trouble to investigate carefully.

In the younger years the so-called exhaustion neuroses are due either to undereating, and this is extremely common, or to the development of dreads which hamper activities and demand the consumption of twice as much energy as would be needed ordinarily for the accomplishment of what they have in hand. Many a man, when working hard under the stress of anxiety and solicitude, disturbs his eating. He then says that his work and worry have caused him to be run down, but what has really happened is that his work and worry have taken him off his feed and then he has run down. Dreads, as brakes on energies, lead to a sad waste of vitality and bring on a state of discouragement in which almost any accomplishment becomes impossible.

MENTAL SUGGESTION VS. PHYSICAL EXHAUSTION

Undoubtedly the most precious neurological lesson learned from the war is the necessity for the most careful avoidance of suggestion to neurotic individuals. Most of the classic symptoms of the hysterias are now seen clearly to have been due to expectancy on the part of the patient once he or she got to know in any way, however indirect, what the physician was looking for. For instance, it had to be emphasized for neurologists during the war that in looking for anæsthetic patches by touches with the pin point, they must not ask, "Do you feel this?" because as that indicated an expectancy in the mind of the examining physician that they might not be able to feel it, in suggestible people the answer would be more or less inevitable after a time at least that they did not feel it. Even before the war Babinski had insisted that the anæsthesia or analgesia which so often affects one-half of the body is the result of suggestion consequently upon the method employed in testing sensibility. It does not exist in the meatus urinarius

nor in the rectum, where both sides prove to be equally sensitive. Babinski insisted that the examination for the cutaneous sensibility must be made with the eyes of the patient closed tight or else well blindfolded, and he must not be asked does he feel, but he must be directed to point out where he feels the sensation and when he feels it.

Few neurologists followed Babinski so far as to accept his declaration that the classic cases of major hysteria, the so-called *grandes hystériques* of the French school which were so common in Charcot's time and just after it and which attracted so many physicians to France because of the opportunity to study them thus afforded were really the creations of the suggestions, usually unconscious, which came from the examining physician. A great many more of these cases were seen in France than in England, but the reason for that was not that the French as a nation are more susceptible to nervous reactions than other nations of Europe and particularly the northern nations, but that the careful attention, frequent examinations and expectancy of the French physicians led them actually indeliberately to bring such symptom complexes into existence. The whole situation is extremely interesting now that it is past and illustrated the great care that must be exercised to keep patients from accepting suggestions from their physicians which may make them utterly miserable and which often add not a little to their symptoms and make their affections not infrequently appear quite different from what they are of themselves.

This question of suggestion is particularly to be deprecated with regard to exhaustion. We have used the phrases "nervous exhaustion," "mental exhaustion," "nervous breakdown," "physical exhaustion," so commonly, apparently in the sense that the patient had actually wasted some substantial source of energy that might perhaps never function properly again as a result, that there is a strong unfavorable suggestion in most people's minds in this regard. They have the feeling as a consequence that they have just played themselves out. Our war experiences would seem to indicate that there is no such thing. Individuals with hereditary tendencies and impairment of nervous stability to begin with may, when placed under severe stress and strain break down in such a way that they cannot go on with their work for a while, but the all important element is the constitutional condition and not the hard experience to which they

have been subjected. If suggestion has, as Babinski pointed out, produced major hysteria, and there seems no doubt now that this is true, it is easy to understand that suggestions along the line of exhaustion would produce the symptoms of nervous exhaustion and the neurasthenic incapacity to use faculties which develop so frequently when people get this idea of nervous exhaustion on their minds.

It is extremely important then not to use terms of this kind for which we have no justification in our recent medical experience. A good many people are constitutionally incapable of carrying on certain work which they nevertheless try to do, and it is the physician's business to keep them away from it, but not to suggest that they have exhausted their powers. Some time or other the physician will be looked upon as a life and health engineer, and young folks particularly who have some definite hereditary of mental and nervous disturbance will come to consult him as to what they are best fitted for doing. He will keep them away from the exciting conditions of life and see that their path of existence, as far as possible, keeps them outdoors in the country with plenty of physical exercise and very little of the strenuous city indoor existence which is so likely to be disturbing and which at the end of it all gets people nowhere and only serves to disturb the social order.

REST IN THERAPEUTICS

Exhaustion plays such a small rôle in these patients that therapeutics founded on the idea that what they need is rest is entirely a mistake. The Mitchell rest cure was very valuable, but then it contained two elements that have been found of very great service in the treatment of the war psychoneuroses and which have nothing to do with rest. One of these was the absolute segregation of the patient from all those who would sympathize with his or her symptoms or who would even listen patiently to the long story of what he or she thought their symptoms were. Segregation or isolation, as it was called, but absolute, so that they had no chance to speak to anyone was found to be one of the best possible modes of treatment for the war neurotic conditions. The other element in the " rest cure " was the superabundant feeding even though this consisted only of milk and a few very nutritious materials. Many of these war psychoneuroses were found to occur particularly in soldiers whose disturbance of mind because of the actual danger to which they were exposed, or the dangers which

they feared in prospect, interfered sadly with their appetite for the very plain, unalluring food, which was all that could be served to the soldiers at war under the circumstances.

While the great majority of the soldiers in the camps and in the trenches gained in weight and came home heavier and more solid than they had ever been before in spite of the many hardships to which they were subjected, a certain small proportion of them were rendered so nervous as to be distinctly off their feed. These ran down in weight and constituted a prolific source of neurotic conditions of all kinds. For them the phase of the rest cure that would teach them to eat once more, discipline taking the place of appetite, would, of course, benefit them greatly. Many of them had their neurotic symptoms disappear just in proportion as they gained in weight.

As for rest in the ordinary sense of the word they did not need it and usually were rather hurt by it. At the beginning of the war when all the psychoneuroses were grouped under the term "shell shock" and when shell shock was thought to mean some pathological condition induced either by commotion of the nervous system, as through the windage of a shell or actual concussion, because not a few of these patients were knocked down or covered with dirt in the trenches from the explosion of shells near them, yet presented no external lesions, these patients were unfortunately permitted to rest with the idea that they would gradually get over their symptoms, but, as a rule, they grew worse rather than better as a result of this mode of treatment.

Colonel Mott, in his "War Neuroses and Shell Shock," does not hesitate to say that even passive exercises does harm rather than good for these patients and says: "I am sure that machines employed by doctors as a means of making the functional paralytics move their limbs are wrong in principle and in practice." He feels that only such exercises as originate in patients' own minds, pass through their wills and are accomplished in the muscles, do good. He adds: "The value of natural and varied associated movements, such as we get with the parallel bars, the climbing rope, skipping, basket ball, football, punching ball, Indian clubs, the nautical wheel, and the ordinary apparatus of the old-fashioned gymnasium in the treatment of convalescent cases of functional contracture and paralysis cannot be overestimated. For these exercises have this advantage over machines which move the disabled limb in the fact that the mind is projected

in the paralyzed limb, and all the sound limbs are being exercised at the same time."

All those who have tried gymnastics for these patients have emphasized the fact that their gymnastic work should be done in classes and not as individuals, for the suggestive value of seeing others do the exercises is very valuable, and the spirit of emulation set up does the patients a great deal of good. To see a man perform a series of exercises stimulates others to do the same or even better, interests the mind and adds incentive to the wish to do things. It is the voluntary movements spontaneously accomplished that do by far the most good. Anyone who has ever seen patients suffering from lateral curvature of the spine, exercising between looking-glasses so that they are able to see just what muscles they are using, and has noted the good effects of the practice, will realize how much of value there is in getting patients to use muscles by watching others use them. Nothing so restores the functional good condition of muscles as the sending down of impulses through them from the central nervous system. Passive movements by emptying muscles of the venous blood may accomplish something beneficial, but this does not at all equal what is obtained from voluntary muscle movements which encourages the arterial circulation and makes the muscular condition so much better than it was before.

In England they found the after-treatment by occupation extremely valuable. Neurotics were set to working in the garden or on a farm or in a workshop of some kind for certain hours every day and their interest in this added greatly to its value as a therapeutic agent. Soldiers who suffered from war neuroses were not discharged from many English hospitals until they were able to do several hours of work in a shop or some other rather strenuous occupation. The men became very much interested in carpentering, cabinet-making and metal work when they had a good instructor and as they were paid whatever the articles they made brought in above the cost of the raw materials there was a definite incentive to do something and an interest that adds zest to the work. Patients who are much disturbed by the noise of hammering are given such occupations as book-binding, and the occupation proves helpful. Many of the men were taught singing and there is to be a new crop of singing masters and musical entertainers as the result of the training given in this way as part of the after-treatment of the war neuroses in England.

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